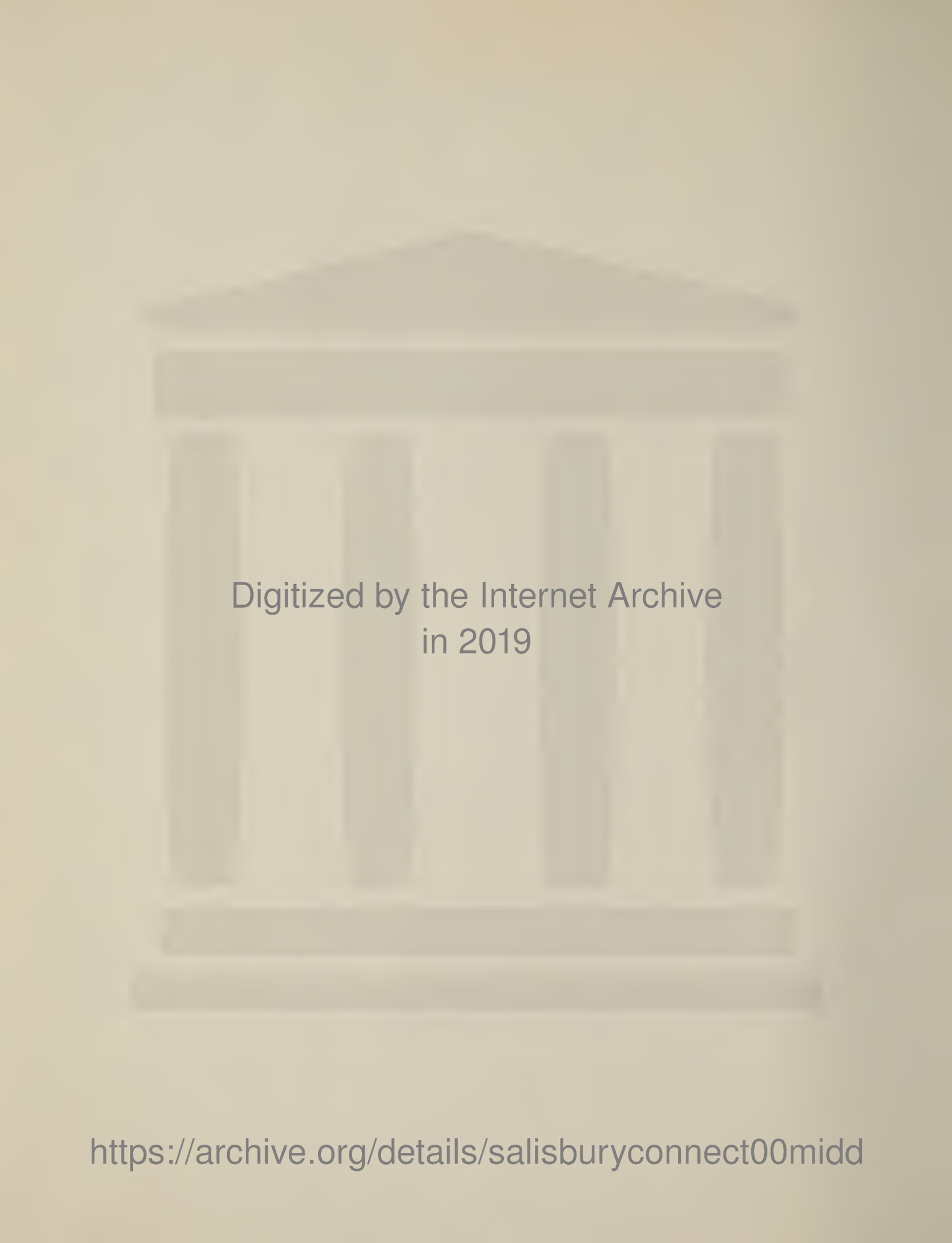
Gc
974.602
Sa34m
1771779

M. E.

REYNOLDS HISTORICAL
GENEALOGY COLLECTION

ALLEN COUNTY PUBLIC LIBRARY
3 1833 01125 7331


Digitized by the Internet Archive
in 2019

https://archive.org/details/salisburyconnect00midd

SALISBURY CONNECTICUT CANNON

REVOLUTIONARY WAR

By

Louis F. Middlebrook

NEWCOMB & GAUSS CO., Publishers
Salem, Mass., U. S. A.
1935

1771779

JONATHAN TRUMBULL

Governor of Connecticut from 1769 to 1784

Harvard 1929

F
84669
.57

Middlebrook, Louis Frank, 1866–

Salisbury Connecticut cannon, revolutionary war, by Louis F. Middlebrook. Salem, Mass., Newcomb & Gauss co., 1935.

3 p. l., 63 p. front., illus., plates, ports., map. 21½cm.

"Limited edition, 202 copies. no. 201."

SHELF CARD

1. Firearms industry and trade — Salisbury, Conn. 2. Salisbury, Conn.—Hist.—Revolution. 3. Ordnance—Manuf. 4. U. S.—Army—Ordnance and ordnance stores. 5. Connecticut—Hist.—Revolution. I. Title.

35-9170

Library of Congress UF534.CSM5

Copy 2.

G 4605 Copyright A 81548 (35c2) 623.42007461

64605

DEDICATED

To my great grandfather Captain Stephen Middlebrook
of Stratford, Connecticut, Watch & Ward Company
Revolutionary War.

—L. F. M.

LIST OF ILLUSTRATIONS

Jonathan Trumbull, Governor of Connecticut . . . . . *frontispiece*

PAGE

Site of Salisbury Cannon Foundry . . 6

Salisbury Iron Works *circa* 1854 . . 9

Portrait of Capt. Samuel Forbes, Ironmaster 11

Eighteenth Century Blast Furnace . 24

Construction of Cannon Mold or Shell . 26

Drying of Cannon Mold or Shell . . 27

A Ship's Gun and Its Carriage . . . 35

Boring Mill 37

Swivel Patterning 39

Trunnions, Patterns and Ornaments . 40

Miniature, Col. Joshua Porter . . . 46

A 6-Pounder Gun 48

An 18th Century Gun Named "Hanks" . 50

Iron Swivel Gun 51

Two Swivel Guns from Yorktown . . 52

Blunderbus Swivels 53

FOREWORD

THAT the Colonists, with the possible exception of those in Connecticut, were unprepared and without munitions of war in 1775 is an undisputed fact. What meagre supplies were acquired to begin with were either seized or captured in combat until other ways and means to produce them were found.

It is not generally known that, on April 28, 1775, nine days after the actual outbreak of hostilities occurred at Lexington and Concord, when Hancock's express riders had brought the news to Connecticut, three hundred pounds (£300) were taken out of the Colonial treasury of Connecticut by Silas Deane of Wethersfield, Samuel Wyllys of Hartford, Samuel Holden Parsons of Lyme, Thomas Mumford of Groton, and Adam Babcock of New London, without the knowledge of the Assembly, in order to plan and finance the secret expedition under Ethan Allen with a small force of eighty-three men for the purpose of surprising and seizing the British post at Ticonderoga, for which they gave promissory notes. (£510 more were taken in like manner from the Connecticut treasury May 15th and 17th for the necessary expenses of the party, their support, and sustenance after the raid.) The object of that sudden and daring expedition was to acquire the enormous amount of warlike stores, especially the cannon, that were in the possession of the enemy at that post, for use of the Provincial forces.

The conception of this raid was accredited to Col. Samuel Holden Parsons[1] of Lyme (1737-1789), who drew into conference his fellow conspirers immediately after the general alarm from Boston had reached Connecticut. The final adjustment of their action did not take place until May, 1777, when the following resolution is found recorded in Volume 1, pages 292-3, of the Public Records of Connecticut:—

"Upon the memorial of Samuel Holden Parsons Esq^{r}., shewing to this Assembly that in April 1775, the memorialist together with Col^{o} Samuel Wyllys, Mr. Silas Dean and others did undertake the surprizing and seizing the enemies post at Ticonderoga without the knowledge of the Assembly, and for that purpose did take a quantity of money from the treasury, for which they gave their promissory receipts, and that the whole

[1] Samuel Holden Parsons, American soldier, b. Lyme, Conn., 14 May, 1737; d. near Marietta, Ohio, 17 Nov. 1789. He was graduated from Harvard in 1756, admitted to the bar 1759, and practiced law at Lyme, Conn. For 18 years he was a member of the Connecticut State Assembly, and is accredited with originating the idea of a General Colonial Congress. At the outbreak of the Revolutionary War he was appointed Colonel and stationed in Massachusetts. He planned the capture of Ticonderoga, executed by Col. Ethan Allen, and after the evacuation of Boston by the British was transferred to New York, where he participated in the battles of Long Island, Harlem Heights, and White Plains, and later served under Washington in New Jersey. He was a member of the Board which tried Major John André, and in that year was promoted Major General, and succeeded to the command of Israel Putnam, which he held until the close of the War. After the War he resumed his law practice, and was appointed by Washington in 1789 the first Judge of the Northwest Territory, and took up his residence near Marietta, Ohio, where he died the same year.

of said moneys were expended in said service; praying that said receipts may be canceled and given up, as per memorial on file: RESOLVED by this Assembly, that said receipts given as aforesaid be delivered up to the memorialists or some of the persons who executed them, to be cancelled, upon their exhibiting and lodging with the Committee of Pay-Table the accounts and vouchers of their disposition and expenditure of the sums contained in said receipts, which are as follows, viz: One receipt dated 15th May 1775, for £10: 0: 0 signed Samuel Bishop, junr of New Haven, William Williams (of Lebanon) and Samuel H. Parsons; one receipt dated 28th April 1775, for £200-0-0 signed Thomas Mumford, Samuel H. Parsons, Silas Dean and Samuel Wyllys; one receipt dated same 28th April 1775 for £100-0-0, signed Thomas Mumford, Adam Babcock, Samuel H. Parsons and Silas Dean; and also one other receipt dated May 17, 1775, for £500-0-0, signed Joshua Porter (of Salisbury), Thomas Mumford, Jesse Root (of Coventry), Ezekiel Williams (of Weathersfield), Samuel Wyllys and Charles Webb of Stamford. And it is further resolved, that the Committee of Pay-Table upon receiving the said accounts and vouchers of the expenditure of said monies charge the amount thereof to the Continent, and that the amount of the sums contained in said receipts be allowed the Treasurer in account with this State on his delivering up said receipts pursuant to this resolution."

The cannon and munitions were sorely needed, and the efforts and prompt action of these men of Connecticut form one of the most prominent features in American History. The Inventory[2] of the results of that notable expedition follows:—

[2] Lossing's Field Book, Amer. Rev.

120 pieces of cannon
2 10″ mortars
1 howitzer
1 cohorn
50 swivels
10 tons of musket ball
3 cart loads of flints
30 new gun carriages
A quantity of shells
100 stands of arms
2 brass cannon
10 casks of powder
and
48 prisoners of war, who with their commanding officer Capt. De la Place were brought down to Hartford gaol and there confined

These stores were surrendered with the fortress, to Ethan Allen, on May 10, 1775, — 20 days after the battle at Lexington.

In November, 1775, Gen. Henry Knox brought down 55 cannon, 2500 pounds of lead, and a barrel of flints from Ticonderoga to Cambridge on ox sleds; some of these cannon went to Dorchester Heights and were there used in bombarding the British positions, which eventually caused the evacuation of Boston in March, 1776. More cannon from Ticonderoga found their way to the coast positions and posts established by the Colonists for defense. A letter from Joshua Huntington of Norwich to the Congress written in February, 1776, includes the following appeal:—

"I also request that the Matter of furnishing Cannon for securing the Harbour of New London might not be delayed. It is the only Harbour in this Colony & I think it of utmost importance to us to have it Strongly Fortified & that without Delay. I know of no way to procure Cannon So Readily as to bring them from Ticonderoga. Wish I had an order from Congress for about Fifteen or Twenty from Eighteen

to twenty four pounders. I would Soon have them Down. Would Willingly Leave all other Business at this Time. I am afraid it will be Delayed Untill it is Too Late. Pray Exert your Self in this matter. Not only the preservation of New London & Norwich but the Safety of the Whole Country may depend on it, & in fact it may prove a Vast Saving to the Continent, in keeping open a Channel for bringing forward Flour and other provisions from the Westward. I mention above that I wish had an order for Cannon." [3]

The cannon were apparently "brought down," as according to a letter[4] from Andrew Huntington to his brother Joshua August 12, 1776, he states that a part of Col. Finney's Regiment with teams were sent to Ticonderoga and that he had advanced £25 in cash to six of the men to carry them to "Ticondiroga."

Long before this time, however, plans had been made by Governor Trumbull and his Council of Safety, for the casting of cannon and shot at Salisbury.

These necessities were scarce, although some of them had been purchased in the French and Dutch West Indies and brought in as ballast. Eighty-one cannon and an enormous amount of accessories had also been brought into New London by Commodore Hopkins in April, 1776, captured at New Providence.[5]

— L. F. M.

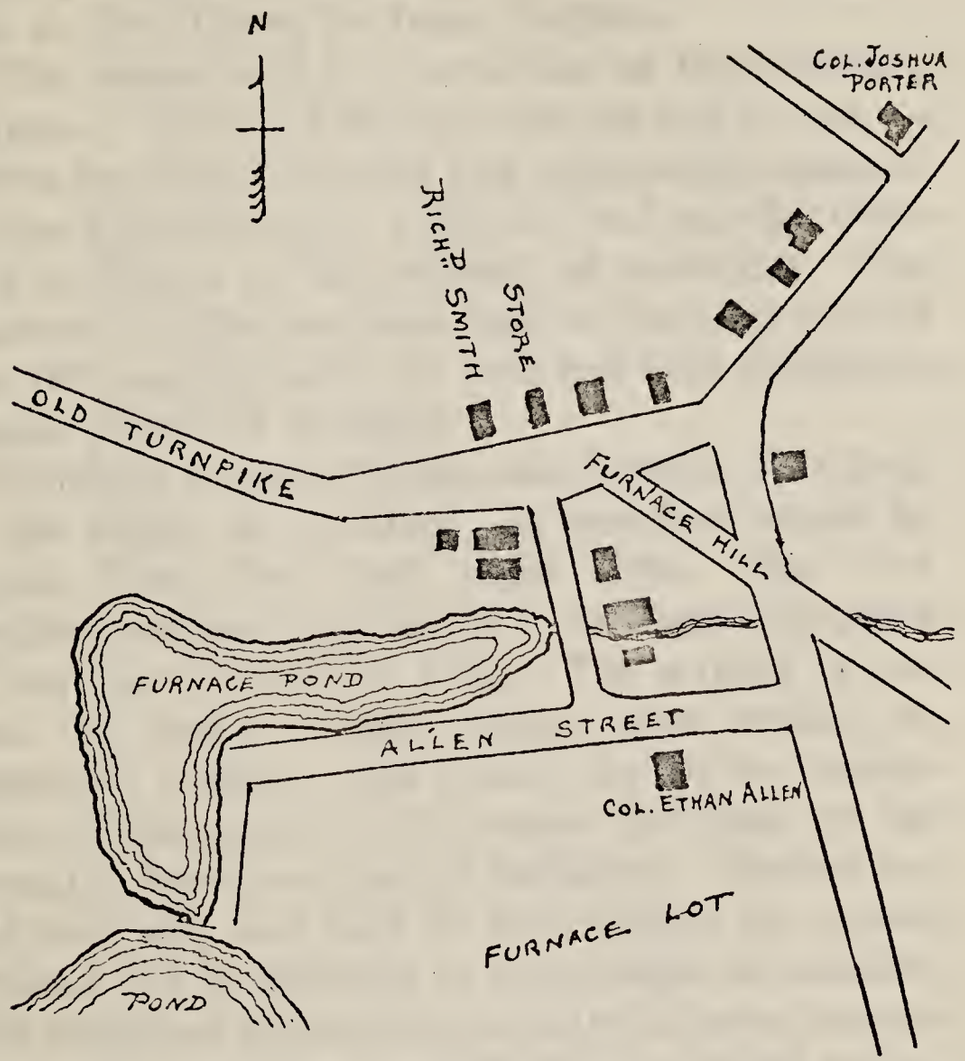
[3] Huntington Papers, Conn. Hist. Soc.
[4] Ibid.
[5] Maritime Connecticut, Vol. 1, pp. 11-12.

SALISBURY CONNECTICUT CANNON

THIS work will be concentrated upon a special subject which does not seem to have been particularly considered in histories pertaining to the Revolutionary War.

The Colony of Connecticut was amply though quietly prepared for the coming struggle. Perfect unanimity prevailed. It was unnecessary to reconstruct the government as was done in Massachusetts Bay, or to depose the Governor as was done in all the other Colonies. A Council of Safety was immediately set up to administer everything that was necessary to set in motion the preparations that had already taken form. It was a firm governing body with headquarters at Lebanon, 25 miles north of New London, and was composed of many of the Colony's most able men. Eleven hundred and forty sessions[6] were held there in Jonathan Trumbull's little "War Office" (still standing and previously used as a country store). It was there that couriers arrived with dispatches, and, with orders from that place, hurried away for New York, Philadelphia, Boston, Providence and elsewhere. Here were written the orders by the faithful secretary of the Council, John Porter, for the field and camp, and plans made for the raising of troops, establishment of fortifications at New London and along the Connecticut coast line, fitting out of war vessels and privateers, the purchasing of provisions, disposing

[6] Miss Ellen C. Williams of Lebanon.



SITE OF REVOLUTIONARY WAR CANNON FOUNDRY AT SALISBURY, CONNECTICUT

Courtesy of Malcolm D. Rudd, Lakeville, Ct.

of prisoners, and providing munitions of war. Powder mills had been erected at Windham and operated by Col. Jedediah Elderkin and Nathaniel Wales, — at East Hartford by William Pitkin, — and at New Haven by Isaac Doolittle.

The cannon and shot were cast at the Salisbury Furnace. Here was the extensive ore bed of iron, — brown hematite, — owned and occasionally operated by one Richard Smith, a Royalist and merchant who fled to Boston at the outbreak of hostilities. The discovery of this ore dates back to the early part of the 18th century after the land had been granted to Daniel Bissell of Windsor.

Salisbury is about 63 miles northwest of Hartford, in the corner of the State. It was first settled by Dutch from New York about 1720. The New England settlers came to the town about 1740, and it was incorporated in 1741. The mining of the iron ore found in the vicinity soon became an important industry, and during the entire Revolutionary War much of the cannon and shot for the several Colonies was cast at Salisbury. Surface ore had been dug and used in that locality by various artisans and blacksmiths in their forges as occasionally discovered references guardedly indicate, because it was not considered strictly loyal or legal to use iron except when it had been properly acquired by importation from the Mother Country. The Colonists were more or less handicapped and were what might be termed "illicit traders" if they availed themselves of needed commodities without having first "ren-

dered unto Caesar . . .". But the Constitution of the Colony of Connecticut had been adopted in 1639, and its Charter followed in 1672, both defended and preserved. Rights were granted by both documents, so that the Colony in this respect was perhaps better off than some of the others, and many of the Colonists felt their advantages more consoling and useful.

The entire Works, including ore beds, limestone, woodlands for charcoal, and the blast furnace itself, were all properly confiscated by the new State, and placed under the management of Col. Joshua Porter of Salisbury (now Lakeville), who was appointed as overseer March 18, 1776, and given legislative authority to engage the necessary personnel with which to operate the important industry of cannon casting for the use of State and nation.

This iron blast furnace was the *"single instance of a furnace, the only one in the Colony for making pig iron"* referred to by Governor William Pitkin December 5, 1766, in his report to the Lords Commissioners for Trade and Plantations at London,— and Chief Justice Samuel Church, LL. D., was correct in his statement delivered at Litchfield in August, 1851, when he said that no manufacturing interest was prevalent in northwestern Connecticut much before the Revolutionary War. The policy and laws of Great Britain had discouraged this. But the rich iron mine which had been early discovered in Salisbury could not lie neglected. Iron was indispensable. The ore bed there had been granted by the Colonial Assembly to Daniel Bissell

THE SALISBURY IRON WORKS

Circa 1854

Courtesy Malcolm D. Rudd, Lakeville, Ct.

of Windsor as early as 1731 and produced a better quality of iron than any imported from abroad or found elsewhere at home. The manufacture of bloomed iron in small quantities, in the region of the ore, commenced before the organization of some of the towns in what later became Litchfield County, and as later shown by various deeds of conveyance granted and recorded in the Salisbury Town Records, when it became a town.

The ore bed in Salisbury was set off and referred to as Lots Nos. 18 and 19, First Division. The map of this famous ore bed is very complicated and bewildering, as discovered in the papers of Samuel Forbes, Esq., of Canaan (1729-1827).[7]

The first deed appears in Book 1, at page 139, when Benjamin White conveyed Lot 19 to Samuel Bellows December 27, 1742-3. On March 4, 1745-6, Samuel Bellows deeded the ore on the easterly part of Lot 19 to George Holloway (Book 2, page 30).

Thomas Lamb, who came from Pascotanck County, Province of North Carolina, may have acquired access to the ore by means of some agreement with Daniel Bissell, as evidence indicates that he erected a forge at Lime Rock as early as 1734, and his experiment was soon followed by others in Salisbury, Canaan, Cornwall, Kent, Norfolk and Colebrook, the ore being transported from the beds to the several forges in leathern sacks on horses. Bar iron, therefore, became a sort of circulating medium of trade,

[7] Papers of Everett E. Lyles.

and promissory notes were oftentimes made payable in iron rather than in money.

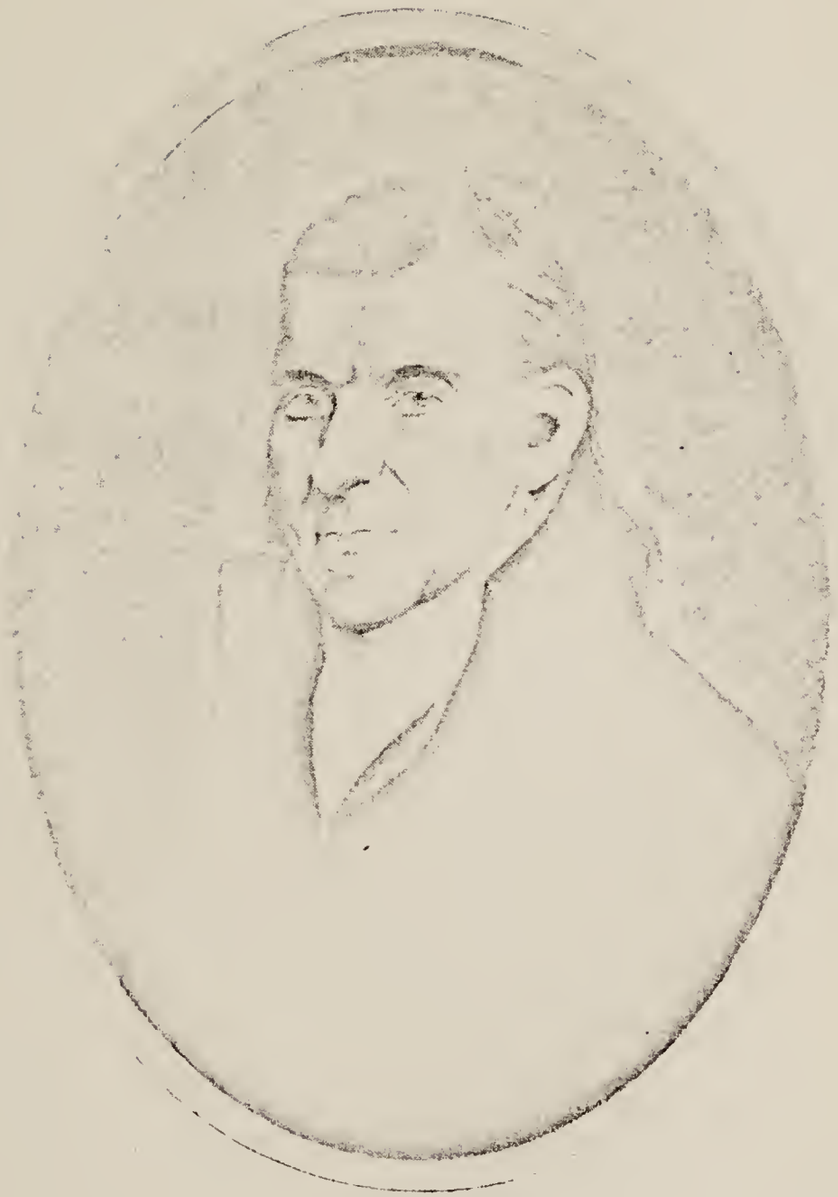
Who else, if anyone, owned or acquired the ore between 1734 and December 27, 1742, when Benjamin White owned it, has not been determined.

The next transfer of the ore appears in Book 3 at page 534, when Ann Holloway, on September 24, 1759, deeded all of the ore that she owned on the easterly part of Lot 19 to Robert Livingston, Jr., an iron-master living at Albany and owning iron works at Ancram over the New York border.

One Philip Chatfield seems to have been an owner of the ore also, as a deed is found recorded in Book 3 at page 605, dated November 25, 1760, by which he conveyed all the ore he owned on the eastern part of Lot 19, to Robert Livingston, Jr. Chatfield had evidently acquired possession of the ore perhaps as a quick speculation, for at page 608, Book 3, is found the record of a transfer to Chatfield under date of December 2, 1760, of all the rights of one John Reed of Stamford to Lot 19 receiving the ore on one acre. Robert Livingston, Jr., had already disposed of his holdings to John Reed by deed which, however, did not get recorded until March 30, 1761, although conveyed the previous year.

On November 16, 1761, John Reed conveyed to Samuel and Elisha Forbes of Canaan, the so-called "Chatfield" ore bed, consisting of one acre of ore on Lot 19, and the "first bounds" of Lot 18 ore bed was attached to the above deed.

The next transfer appears recorded in Book 3,



CAPT. SAMUEL FORBES
Iron-master

(By courtesy of Everett E. Lyles)

page 764, when Lennerd (*sic*) Owen, Elijah Owen and Eliphalet Owen, all of Salisbury, deeded to Col. John Hazelton of Uxbridge, Massachusetts Bay Colony, and Samuel and Elisha Forbes of Canaan, and Ethan Allen of Cornwall, the privilege of cutting and coaling two thirds of the proper coal wood standing on a tract of land purchased of Thomas Lamb of Pascotanck County, North Carolina, said wood tract located on Taconnick Mountain about 376½ acres,—said deed from Lamb dated May 27, 1761,—"the wood to be cut and the brush piled up according to husbandry,," and the Owens brothers agreed never to build any Iron Works or Furnace that would damnify the said Hazelton, Forbes's or Allen, and gave full liberty to the latter to build a Furnace on said land and to use the water in the ponds to carry the Furnace. This deed is dated January 8, 1762, and is witnessed by John and Ann Hutchinson.

The first Furnace for the production of cast iron was built at what is now Lakeville in 1762 by Col. John Hazelton, Capt. Samuel Forbes, and Col. Ethan Allen of Ticonderoga fame, and "Squire" Samuel Forbes became the prominent factor as the original iron master in that section of Connecticut. He was born at Simsbury November 10, 1729, went to Canaan with his father, John Forbes, in 1743, married Lucy Pierce of Canaan August 23, 1754, and had several children. He died at Canaan, Connecticut, November 27, 1827, aged 98 years.[8]

[8] Papers of Everett E. Lyles.

This furnace at Salisbury (Lakeville) was operated for some time by this partnership, but was sold to Charles Caldwell of Hartford and George Caldwell of Salisbury, who continued the industry until December, 1768, when several deeds appear transferring their interests to Richard Smith, merchant, of Boston, who had also acquired other interests in an iron works at Colebrook, where "refined" iron, or steel, was manufactured for making tools.

Difficulties were encountered in adjusting the conveyances from the Caldwells, due to incumbrances with others from whom loans had been negotiated. These difficulties were overcome by Capt. William Tiley of Hartford, who acted as attorney for Richard Smith, and succeeded in having an execution granted by the Assembly's decree dated April 18, 1772, in answer to a petition made in May, 1770. A quit-claim deed also appears from Ezekiel Williams, Esq., of Wethersfield (a claimant).

As to the Colebrook works where "refined" iron was made, this little plant was evidently one referred to by Governor William Pitkin in his report to London, as "works for refining said pigs into bar iron, which fall short of supplying the inhabitants with a sufficiency of iron — *also one refinery for steel,* but not sufficient to supply the inhabitants with that article." The Colebrook plant was an extremely isolated one, difficult to get to, and from, with its product. Just when it was acquired or originated has not been determined, but evidence is found that Smith petitioned the Assembly in May,

1771, for a new highway from the dwelling of Seth Smith in New Hartford, northwest by the side of the Farmington River, through New Hartford and through the township of Barkhamsted and by the Iron Works of Richard Smith, to meet the highway near the dwelling of Joseph Rockwell of Colebrook, about 8 miles. Nothing was done and the petition was renewed in May, 1772. Nothing was done at that session, but in May, 1774, the new road was authorized by Act of the Assembly, and this opened a fair artery for the marketing of his refined iron or steel. The tools for boring cannon and other purposes were made at Colebrook. At the opening of the Revolution, Smith returned to England leaving these iron or steel works in charge of his clerk, one Jacob Ogden,[9] a native of New Jersey, who carried on the work of refining iron at Colebrook during the War. Ogden was born November 10, 1749, married in 1772 Jerusha Rockwell, daughter of Joseph Rockwell of Colebrook. He died March 30, 1825. These iron works were burned August 30, 1781. Ogden then removed to Hartford, where he carried on as a merchant. He was a vestryman of Christ Church in Hartford and was a liberal subscriber towards its erection.

On August 20, 1779, he filed a "memorial" with the Council of Safety in session at Lebanon, — to have ten men exempted from a draft in the army until the succeeding January, as follows: "*Resolved,* — That William Denison, Charles Mc-

[9] Ogden Genealogy.

Carly, John Mead, Charles Day, Peter Codman, John Johnson, William Marshall, John Bates, William Ransom, and Chief Colman an Indian from Oblong (N. Y.) be exempted from any draught till the first of January next (unless upon a general alarm) or their leaving said Ogden's service." (Vol. 2, Records of Connecticut, page 387.)

Again, at Hartford April 23, 1780, — "Upon the petition of Jacob Ogden of Colebrook shewing to this Board that he hath employed a number of hands in the steel and iron manufacture works at said Colebrook, principally foreigners, and that it is impracticable for him to carry on said business so necessary at this time for the public in general, and of the utmost utility to the inhabitants of this state, unless he and his workmen can be exempted from drafts during the time they are employed in said service and praying that they may be, *Resolved,* by this Board that the memorialist and to the number of eleven of his workmen, being principally foreigners, be and they hereby are exempted from detachment to serve either in the militia or Continental Army while employed and actually serving in said works for the year ensuing."

These iron or steel works were also confiscated by the Council of Safety, and tools of all sorts were made there until the place was destroyed by fire.

Governor Trumbull and his Council took first action toward the use of the Salisbury Furnace for providing the necessary munitions of war on January 9, 1776, as it was reported to be "in good repair and

capable of being improved to the great advantage of the public by manufacturing iron, casting cannon &c." Col. Jedediah Elderkin of Windham was appointed as a "Committee" to investigate, and reported his findings to the Council January 29, 1776. And on February 2, 1776, the Council voted to take over and improve the Furnace, and reappointed Colonel Elderkin as their agent to again go to Salisbury, accompanied by his son Bela, and do everything necessary, and to arrange for the coal and wood and 50 acres of land near the Furnace belonging to Mrs. Hamlin and Mrs. Whittlesey. Governor Trumbull (Feb. 3, 1776) lent Elderkin £100 to enable him to do the necessaries at the Furnace in preparation for the casting of cannon. And on February 16, 1776, Lemuel Bryant of Middleborough, Massachusetts Bay, was employed as cannon founder, David Carver, Zebulon White, and David Oldman were engaged as moulders, — "and if any more moulders be brought, to go to Salisbury before April 1st 1776." On March 18, 1776, Col. Joshua Porter was voted "Chief Provider and Overseer of the Works." The Governor and Council, however, had a general superintendence over this important industry during the entire seven years of the War, and, as Stuart says in his Life of Jonathan Trumbull, published in 1859, — "It is plain from the memorials that remain, that his energy particularly prompted its success. Much of the time he had an express-rider running from his own door at Lebanon, to bear his own, or the orders of himself

and Council, to its overseer, Col. Joshua Porter, or to its managers, Henshaw and Whiting. The cannon from this famous establishment, its shot, its munitions generally, for military and naval use, it fell to him, very often at his own discretion, to distribute, — now to the selectmen of towns, or to posts upon the coast, now to armed vessels in the Sound, or to points of defence out of the State, and now to sell or exchange them, as was sometimes the case, for West India goods that were in demand for workmen or for the soldiery of Connecticut."

The largest cannon cast here during the Revolution were 18 pounders of about a ton in weight. Improvements had to be made in 1778 so that 32 pounders could be cast for the Navy, as well as for other States. These cannon were cast solid and were bored and tested near Barnet's old sawmill. The method employed for boring and calibering has been searched out and hereinafter recorded, as well as other important questions of mechanics in connection with the care and skill employed to produce the required results.

It is somewhat interesting in reviewing the day-books, ledgers, agreements and correspondence, still extant, to record some of the details of these old accounts so scrupulously kept by Benjamin Prime, the clerk of the Works, during the stress and anxiety of the time. It is not difficult to picture the hardships endured in supplying the needs of the country with the warlike necessities of defence that were so ably provided during the Revolutionary

conflict. The heavy teaming, poor roads, long distances, hilly country, and slow progress, all formed the tremendous impedimenta that had to be overcome. The specially employed express-rider, William Wheeler, was almost constantly in the saddle between Lebanon and the Salisbury Furnaces with his orders, dispatches and mail for those who were so continuously employed and isolated in that wilderness during the trying times of the Revolutionary War. It was at best a two days' journey and sometimes three, of over a hundred miles in those days with stops at Hartford and Winchester for "oating and baiting" and changing of horses. The alternate route by way of Litchfield would sometimes be taken when occasion required; and when the roads were impassable during the winter months, and blocked with snow, the furnaces were oftentimes "stopped" and the workmen hibernated for want of ore, charcoal and limestone. The charcoal which was required in large quantities came from far and near. Many signed agreements, bonds, and contracts for this important supply are found on file. From Cornwall, Stephen Miles, Stephen Miles, Jr., John Miles and Timothy Rowley are recorded as regular sources of supply. From Canaan, Elias Jackson; from Sharon, Thomas Whetten, Zebedee Turner, and Ephraim Bailey; from Sheffield over the Massachusetts border came Samuel Kingman; from Salisbury, Charles and Aaron Owen; from Oblong (N. Y.) Ephraim Jones, Abraham Grimes, John Fox and Seth Calkins. The master colliers at the Furnace were Capt. John

Welsh and Simeon Strong. Among those rating as "colliers" were Nicholas Porter, William Matthewson, Ebenezer Calkins, and Thomas Ficks of Colebrook. The regularly employed teamsters included Benajah Williams, Amos Hanchet, Robert Whitcomb, Joseph Holmes, Ezra Sheldon, Hezekiah Sage, and one Nathaniel Gilbert of Sandisfield, Massachusetts Bay. There were many ore-diggers, — among whom was John Pudney. The pattern-makers were Medad Parker and Joel Camp, the former patterning the swivel guns, and the latter the cannon. The chief banksman was Daniel Forbes. The expert employed properly to fill the furnace stack for the blast was Edward Whitcomb; and John Owen kept the boarding house for all the "hands." Among the many whose services were required for cutting and carting wood were Ebenezer Fitch, Benjamin Eggleston, and Thomas Conklin, during the years 1776 and 1777.

The following detailed items which have been taken from the books of account kept by the overseers are given in order to precipitate the investigation and proof of the methods employed in the art and trade of cannon casting at that time. Inborn intuition, ingenuity and, as records show, trained iron workers and smiths were relied upon at first crudely to produce the desired weapons of defence to tide over the emergency until more skilled assistance could be obtained.

On the 2nd of July, 1776, a letter from Jonathan Fitch of New Haven to Col. Joshua Porter, states

that he was sending up 514 pounds of black lead,— which was used for smearing the exterior of gun patterns so they would not stick to the mold or matrix when removed.

On the 2nd of December, 1776, George Marsh was allowed credit on his account for the use of tools:— 8 files, a chaplet (a wrought iron stud for holding a core rod in position within the mold), a large band for the Boring Mill shaft, for 96 pounds of best London steel, and for boring some 4 pounder and 6 pounder guns and 3 swivels.

On February 7, 1777, a settlement was made with Joel Camp amounting to £56–4–10 for sundries including the making of gun patterns.

On April 12, 1777, Timothy Bliss received 12 shillings for the use of his tools "last winter" for boring of guns.

On June 2, 1777, Benajah Williams was paid for carting one gun pattern from Joel Camp's; and on June 19th for carting others to the furnace, from the same source.

On June 2, 1777, Aaron Swetland was engaged by the overseers Henshaw and Whiting to cut off the sprues of all cannon cast at the furnace during "the present blast," — for 12 pounders, 9 pounders, and 6 pounders taken together at 7 shillings each; for 4 pounders and 3 pounders together at 4 shillings, and find his board, — the Managers to find the tools to cut the sprues (the metal which fills the "sprue-gate" after solidification).

On June 12, 1777, Thomas Ficks of Colebrook

was paid £3–12–0 for 18 days' work about the *Molding house,* and for his attendant mason.

On June 17, 1777, Medad Parker was allowed £2–5–0 for making a swivel pattern and £1–0–0 for making rollers for the *Boring Mill.*

On June 26, 1777, the Council of Safety at Lebanon voted:— "That the overseers of the Furnace at Salisbury remove the mill erected for the boring of cannon to some more convenient place."

On July 23, 1777, Robert Whitcomb was allowed £1–10–0 for himself and team hauling timber for the *Boring Mill.*

On September 27, 1777, Ezra Sheldon was allowed 9 shillings for carting 6 cannon to the *New Boring Mill* to the place of "Proving," and on December 8, 1777, he was paid £5–0–0 for carting 25 cannon from Boring Mill to Furnace Lot.

On September 6, 1777, Amos Hanchet received £1–11–6 for carting 9 cannon to the *New Boring Mill.*

On October 5, 1777, Capt. James Holmes was paid £18 for drawing cannon from the Boring Mill.

On October 31, 1777, Thomas Chipman received £9–11–3 for boarding Timothy Bliss and his boy for boring guns and for labor of sundry other hands while the *New Boring Mill* was building.

From a perusal of some of these items it is quite evident that improvements had been inaugurated,— due perhaps as a result of Col. Jedediah Elderkin's

errand to Salisbury as a member of Governor Trumbull's Council, by vote of that body April 4, 1777. At that time it was arranged that Col. Elderkin was to make all due inquiry at Boston and elsewhere concerning the newest and best model of cannon of 18 pounders and under, and any other dimensions, and also the newest and best method of boring them, and, in general, of everything relating thereto which might be useful to be known and for the best interest of the American cause; and all gentlemen concerned and acquainted with such matters were requested to communicate to Colonel Elderkin any knowledge they might have, and to assist him in gaining any assistance and skill in the premises.

In addition to the blast furnace it is certain from the foregoing entries, that there was a *"molding house,"* and a *"Boring Mill,"* and that in accordance with a vote of the Council the original Boring Mill was removed to a more convenient location and was then called the *"New Boring Mill."* There was also a *"Furnace barn,"* a *"Bridge house,"* and the *"Upper Dam"* according to the orders issued by the officer of the guard, Benjamin Prime. There was also a *"Guard House."*

Hundreds of cannon and tons of shot were cast at this place during the Revolution as shown by the multitude of orders emanating from the Council of Safety. They found their way into many ships commissioned both for the State and for the privateers of which there were some three hundred vessels

first and last, from Connecticut alone.[10] Many of the cannon were used as field pieces and in the various forts and batteries erected along the Connecticut coast. Depots for their reception from the Furnace were maintained at Hartford, New Haven, Norwich, New London and Middletown. The carriages for both field and ship mounts were made by various artificers, the more prominent of whom were William Lax of Norwich and Stephen Ranney of Middletown.

The extreme importance of the Salisbury cannon foundry was depicted at different times by the General Assembly as well as by the Council of Safety in the form of Resolutions, one of which was enacted at the adjourned session of the Assembly holden by the Governor and Company at Middletown December 18, 1776, as follows:

"Whereas, the article of cannon is of great importance and indispensibly necessary in warlike preparations for offence and defence and much of ours has in the last campaign fallen into the hands of our enemies so as to render them scarce *and this state is also applied to by the Honorable Continental Congress for a large number to be sent to the northern fronts and for the ships,* and they are also needed for our more immediate defence, and there appears no way to obtain them but by our Foundry at Salisbury, and there is danger that the furnace will soon be blown out and stopped unless effectual measures are immediately taken to continue the blast, and the manufacturing and casting of cannon as long as possible, therefore *Resolved:* by this Assem-

[10] Maritime Connecticut During the Revolution, 2 vols., 1925.

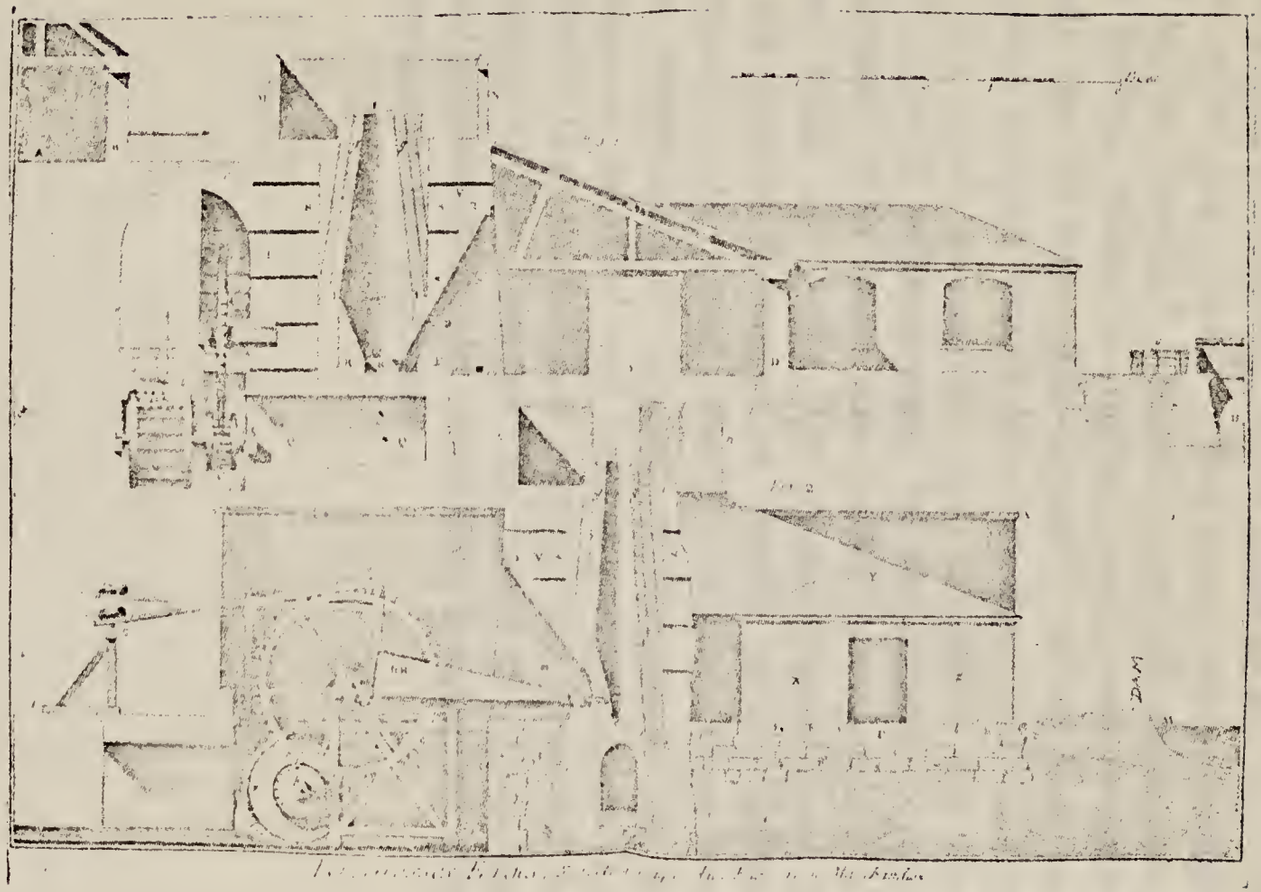
bly, That Benjamin Henshaw be and he is hereby appointed and directed to repair forthwith to Salisbury and apply to Colo. Joshua Porter, manager of said foundry, and afford him all the assistance in his power, to enquire into the circumstances of said furnace and foundry, and to see what is necessary to be done, and use his utmost endeavour in conjunction with said Porter to remove every difficulty and obstruction in the way of continuing said furnace in blast and assist in providing as soon as may be needful all necessary workmen, materials and implements of every kind requisite for carrying on said business; and they are to leave nothing practicable and reasonable unattempted to promote, carry on and continue the casting of cannon there of such size and dimensions as shall from time to time be directed by his honor the Governor and Council of Safety; and to continue there as long as shall appear needful, and to make report of what he shall find and do to this Assembly in their present Session or in their recess, to the Governor and Council of Safety."

Other laws were enacted empowering others to take the care and oversight of various details in connection with cannon casting. William Whiting was added to the committee of management, the hiring of additional men, their billeting, pay, protection by armed guards in the neighborhood, exemption from military or naval duty while employed in the performance of this work, so that no obstacles might be encountered. Forests had to be commandeered to provide wood. Additional wood cutters, colliers, teams and tools had to be supplied, as well as shelter and subsistence, and from the many orders drawn on the Pay-Table, it is evident that these

furnaces at Salisbury responded to the demand and furnished the gruesome wherewithal to a marked degree in output as well as in quality. The working force was as follows:

All exempt from war service	Managers and clark	3
	Founder, firemen and mongers	10
	Draftsmen, patternmen & turners	3
	Borers of cannon	2
	Dressers of cannon	2
	Clay spankers & gutterman	2
	Fillers	2
	Banksman	1
	Ore burner	1
	Ore pounder	1
	Ore wheeler	1
	Carpenter	1
	Colliers & ore diggers	30
	Total	59

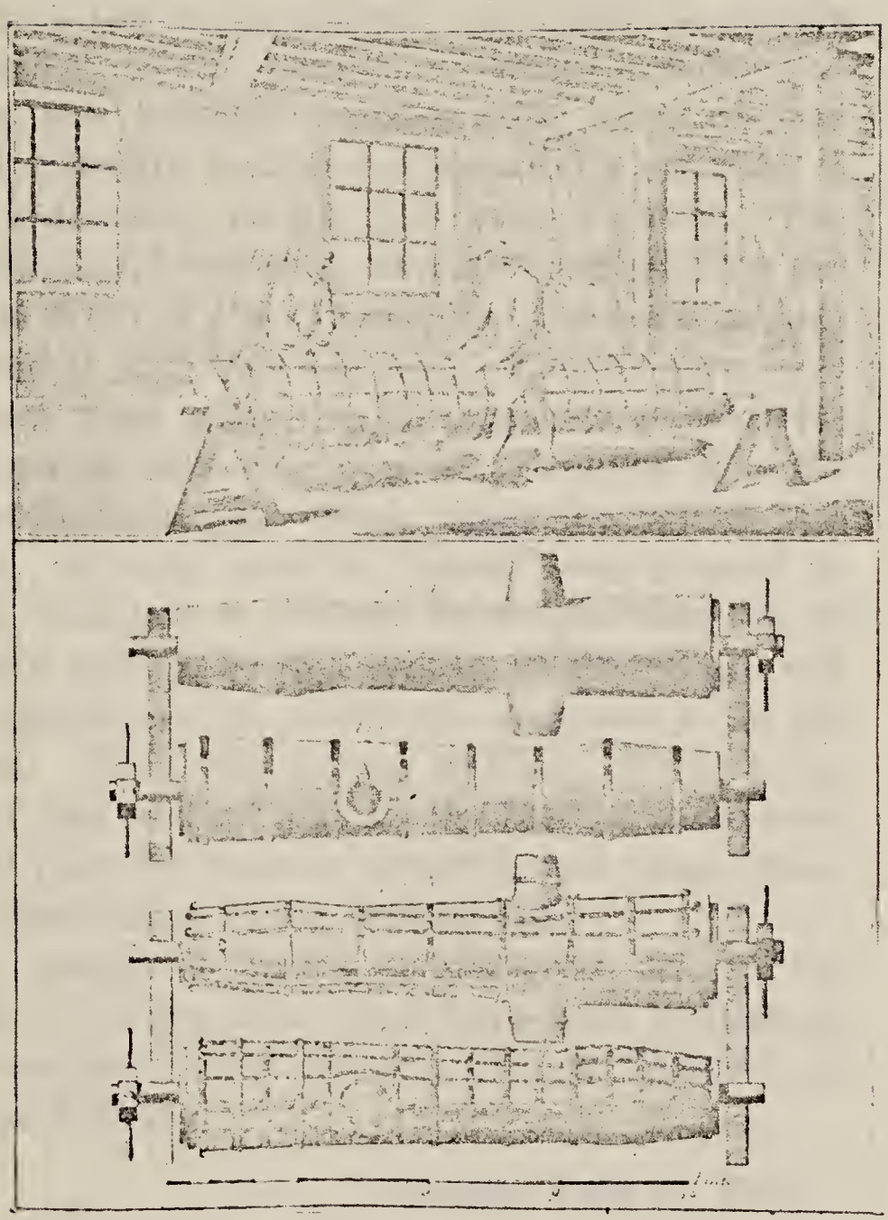
Records indicate that the original furnace was built by the John Hazelton, Samuel Forbes and Ethan Allen partnership in 1762, its daily output being two and one-half tons of iron, requiring three tons of ore and 250 bushels of charcoal per ton of iron. Its blowing apparatus is said to have consisted of a pair of leather bellows driven by a water wheel. The entire equipment was somewhat crude. A ruined portion of one of the furnaces is still standing in Salisbury. They were usually constructed externally of stone, enclosing two truncated cones forming a cavity some 20 or 30 feet high. The upper end of the shaft or cavity would be some 3 or 4 feet in



AN 18th CENTURY BLAST FURNACE AND FOUNDRY

diameter, widening outward and downward to about 7 or 8 feet of diameter, which point of the structure was called the "bosh." The lower cone, inverted, led to the *"hearth,"* a round or cylindrical space at the bottom where the molten metal was deposited ready for the run. The capacity varied from one to three or four tons of iron per day. Into the top of this stack or cavity, ore, limestone for flux, and charcoal were charged by the expert, Edward Whitcomb, who knew how to fill the stack for the blast, while air under low pressure was blown in at the bottom by means of double leather bellows operated by the water wheel. Whether there were bins constructed at the top of the stack for the storage of ore, fuel and lime is unknown, but it is probable that an inclined runway was provided for bringing up the "charge" by means of horses burdened with leather bags containing the ore and other materials to the platform.

IN the founding of cannon there were used special kinds of selected earth of which the molds and models were made, in order to resist the fire and melted metal without cracking or peeling when cast; but whether the pattern-makers were over-meticulous about selecting their earth or clay in Salisbury has not been determined. Some earths would cause shrinking, chapping, breaking or warping of the pattern, — quite similar to the potter's trade, the clay was selected for its fine texture. It was thoroughly beaten and moistened to form a paste, then sometimes mixed with lint from linen cloth, fine sand and ashes or burnt salt mixed with iron filings or what was called "lymmel" of iron, and finally beaten up. Chopped sedge and straw oftentimes went into the mixture to assist in making a firmer pattern, as well as into the mold or matrix. When molded the pattern was smeared with a coating of black lead, or "annointed" with hog's grease to facilitate its removal. The rings, arms, floral devices, mottoes, dolphins or other ornamentations were added either in wax or plaster. The model or pattern was made about one-third longer than the gun itself was to be, and was dried over a long fire. The parts for the cascabel (or knob at the breech of the gun) and the trunnions were formed upon wooden models and then attached to the exterior of the shell or matrix. When the pattern or model had become thoroughly dried little by little over the



CONSTRUCTION OF MOLD OR SHELL

long fire, it was then covered with a coating about three inches thick made of the same carefully prepared earth, called a shell (mold), made and dried in at least two or sometimes more parts to enable the removal of the pattern or model. This shell covering was fastened together with strips of iron or lead laterally and circumferentially to hold it firmly until the casting had been finished. The shell was placed vertically, muzzle upwards, in a pit or tub in front of the furnace, and the earth thrown in around it and well rammed. The runners from the hearth were stopped with iron bars which were withdrawn to allow the flow of the metal into the mold until it became filled, when the orifice was plugged. A large head or "sprue" was allowed in order to maintain a pressure or weight adequate to produce a sufficient solidification at the breech end of the gun where the metal was supposed to be the strongest. When the casting had been finished, the strips of iron or lead holding the shell or mold were removed piece by piece as required, and when cooled the gun was taken to the Boring Mill.

As a matter of record and interest, one of the myriads of letters that must have been written to the overseers of this historic cannon foundry, is given, as follows:

Lebanon, July 17, 1776.

"Sir: I had wrote you this day a letter which will be delivered you by the bearer, to which I refer you; since which your letter of the 16th came to hand. The powder you request will be sent forward directly, and

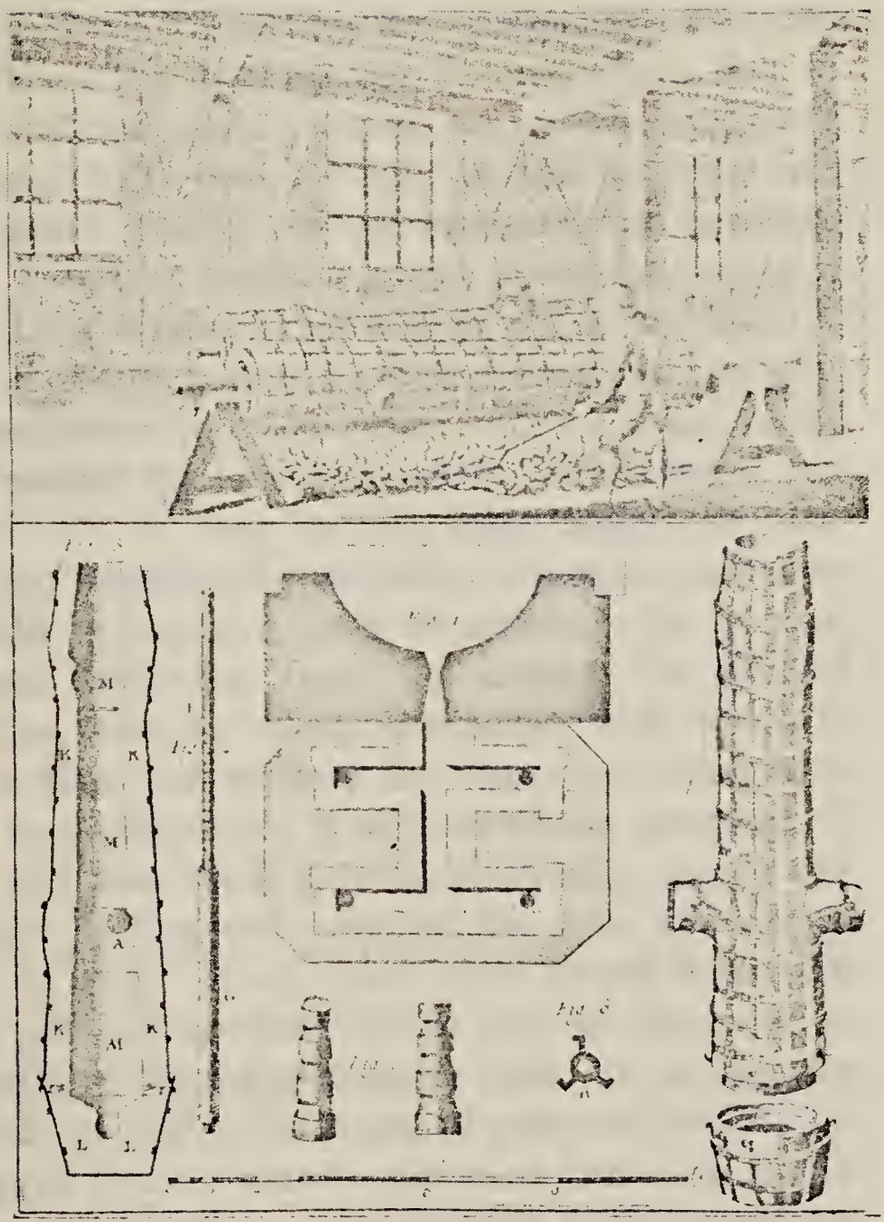
you will load the team back with an assortment of different kinds of Ball you have made, to be delivered to the care of Capt. William Tiley at Hartford. The nine-pounders being now wanted, you will proceed with all diligence to have them *drilled and bored* and deliver them when called for to Colo. Jonathan Pettibone, who will provide proper teams and carriages and transport them to Hartford as soon as may be. The twelve-pounders you will get ready with all dispatch to be transported where the public service shall require them, agreeable to such orders as may be given hereafter; but should a requisition be made by General Washington, you will permit them to be transported to the North River, without waiting for further orders for that purpose. I would have you proceed and cast eighteen-pounders as soon as you find it practicable. I am with Esteem and Regard, Sir,

Your Humble Servant
Jont^{h} Trumbull."

To Colo. Joshua Porter, in Salisbury.

From this letter it is quite evident that the cannon were "drilled and bored," probably by a process as shown in an accompanying illustration.* It is known that the bore of a gun of that period was seldom "true." In some of the Yankee ships that went out against Britain during the Revolution there was a semblance of principle and tactics in the art of Naval gunnery, adopted and practiced according to rule or some set manual for seaman gunners, or else concocted according to the qualifications and experience of the individual officer or petty officer who had acquired a training in the art before the opening of hostilities, or absorbed by instinct. But

* See p. 37.



DRYING OF MOLD OR SHELL

in a large majority of ships, particularly the privateers, such principles were quite elementary, if not entirely lacking. The guns were necessarily of crude construction, the castings far from perfect, due to the hurried manner in which they were produced, and it must have been a rarity to find an American naval gunner skilled enough accurately to measure heights, breadths, lengths, gauge distances properly, and to draw or plot; and seldom did a majority of our naval officers possess all the necessary implements and accessories to work with. There were many things needed for use and safety which could not be provided. If they had the most meagre requirements they considered themselves fortunate, and they were able to improve their situations only by now and then capturing from the enemy the desired necessities, such as caliper compasses with which to measure shot and calibers for them. It must have been a rare occurrence if a gunner was possessed of a staff with two heads thereon accurately spaced and lined for finding out whether his gun was "true-bored" or not. Many guns were found imperfect in this particular, whereby one part of the metal at the base ring would be thinner than on its opposite side, and thereby be the cause of poor marksmanship. Most guns had no muzzle sights or base-ring sights. The base ring was so much thicker than the muzzle ring, that were the muzzle sights provided, they would jam on the outside of the gun port on the recoil when discharged; so that the skill when it was at all pronounced in the combat was largely due

to the gunner's instinct, and if he had a lop-sided bore, the life of his gun, as well as that of his crew and himself, were oftentimes jeopardized by want of this knowledge.

In the proving of cannon, there were several methods employed before they were considered ready and safe for service, such as inspection for flaws, cracks and honey-combs; examination for true bore; measurement for proper size of standard shot and proper limit for powder service charge. The customary rule used in proving was to allow the powder charge 4/5 for proof, and for service 1/2 of the weight of the iron shot. The field gun would be longer than the ship's gun of the same bore, because the latter had to be made shorter on account of lack of room allowed for serving on a crowded deck. The sea pieces, therefore, were usually alluded to as bastard guns because of their shorter "chases." Besides there would be too much weight of outboard metal when the entire broadside was "run out" for combat if they were cast of standard length. The reliable iron guns of the 18th and prior centuries for sea service were, therefore, usually cast with the "Cornice" rings.

The method used to determine flaws, cracks and honey-combs was quite crude. As soon as the gun was discharged at the proving grounds, the mouth of the muzzle was covered up or smothered, and at the same time the touch-hole was "stopped" with the thumb in order to see if any smoke came through any part of the metal. If not, the gun was sound.

Another way was to reflect the sunbeams into the bore with a mirror for the purpose of observing; and still another was by means of a long cleft stick containing a lighted candle. All these methods were then augmented by striking the piece with an iron hammer *"and if you shall at any stroak hear a hoarse sound, then there is without doubt honey-combs; but if in so striking ye piece you shall at every stroak hear a clear sound, then you may be sure your piece is clear of honey-combs, cracks and flaws."*[11]

In order to prove whether a cannon was truly bored or not, the following extra precise method is quoted:—

"First, you must provide a staff and two rammer heads thereupon, and on ye rammer heads there must be two right lines drawn upon them to divide the two rammer heads (that are ye just height and fit ye bore) into two equal parts, and draw lines on ye staff, that ye lines on rammer heads may stand alike, at one end, and at ye other end, and let ye staff come through one of ye rammer heads about nine inches longer than ye cylinder of ye gun, for a handle. Then lay a flat stick on ye muzzle ring, and hold ye side of your quadrant (on ye gunner's scale) to ye stick, and by a string and plummet, find ye middle or upper and lower place of ye metal. Then after you hath found ye upper and lower part of ye metal, put the rammer head into ye gun, and let one hold it hard, and right with ye marks on upper and lower part of ye metal with ye lines of ye rammer head above and below, whilst you put a priming iron in at ye touch hole, and striking hard on ye rammer head, make a mark. Then pull

11 Capt. Samuel Sturmy's Magazine.

it out and apply ye line on ye rammer head to ye mark on ye upper and lower edge of ye muzzle of ye gun, and you may presently see how much ye mark is from ye right line of ye rammer head, to ye right hand, or the left, that is, if ye mark is just on ye right line, ye Bore is in ye midst. But if you find it a quarter of an inch on ye right or left hand so much lieth ye Bore either to ye right or left, and in shooting ye piece, must be ordered accordingly. But how to know whether it be thicker upwards or downwards, or how ye Bore is, the way to know this,—find ye diameter of ye piece at touch-hole with a pair of calipers, then bend a wire a little at ye very end, that it may catch at ye metal when it is drawn out. After the wire is fitted thus, first put it into ye touchhole till it touch the bottom of ye metal in ye chamber; then holding it in that place, make a mark upon ye wire just even with ye touch-hole; afterwards, draw up the wire until it catches at ye metal at ye top of chamber, and there make a mark upon ye wire just even with ye touch-hole. Ye difference betwixt the two marks is ye wideness of ye chamber under ye touch-hole, and ye distance between the first mark and ye end of ye wire, having half ye diameter of ye chamber of ye piece subtracted from it, will leave the half of ye diameter of ye piece at ye touch-hole *if ye piece be true bored.* But if ye measure be more than half ye diameter, then the Bore lieth too far from ye touch-hole and ye upper part of ye metal is thickest, but if it be less, ye under part hath the most metal." [12]

The figuring out of what quantity of powder should be allowed for a gun *not truly* bored depended upon what was found to be the thinnest part of the metal at the breech of the gun, and the results

[12] Capt. Samuel Sturmy's Magazine.

of this computation were supposed to have been recorded (the gun numbered or otherwise identified by a "mark" corresponding to the record), and furnished with each gun, after proving.

As to proper size for shot it was quite generally the practice for gunners to allow about 1/4 inch leeway between the diameters of shot and bore to provide for sufficient vent and easy ramming and wadding, or an average of 1/20 of calibers for safety.

Cartridges were usually made of canvas for the larger guns, and of paper for the smaller ones. In the making, the diameter of the bore of the gun was first taken and 1/22 part of the diameter was allowed for vent; the length was about three diameters of the bore including the pasting. A form or pattern of wood turned to the proper diameter and length of the cartridge plus sufficient length to turn in before pasting the paper on the form was provided. The pattern was first tallowed so the paper would slip off without tearing. When dried and ready for the powder they were each marked with red lead to indicate how high they ought to be filled, after which the end was carefully folded over to make the desired capsule or cartridge, which, when rammed home, would readily be punctured by the priming iron through the touch-hole.

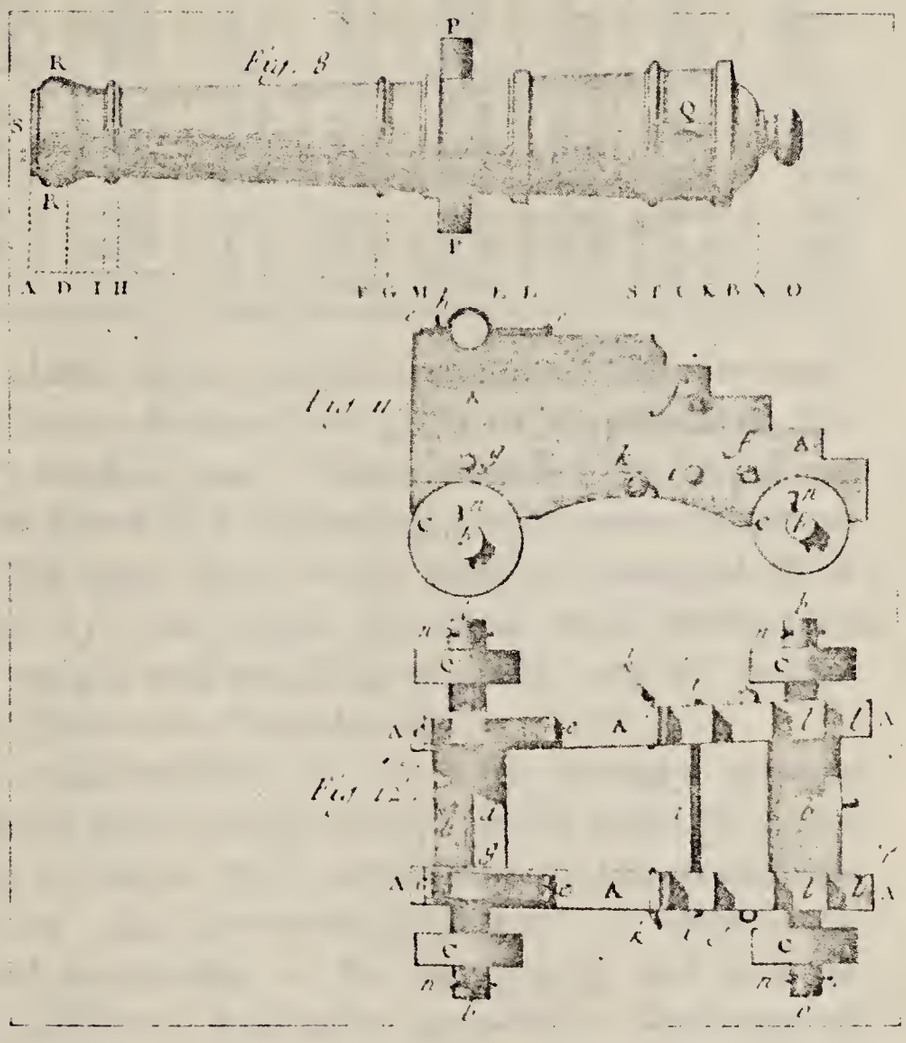
Gunners were supposed to know how to trace, cut out, make up and finish copper ladles (used sometimes in lieu of cartridges), also sponges and rammers, and to provide and properly fit their staffs.

The head of the ladle staff was made nearly the diameter of the shot. For sponges, their bodies were made of soft wood, such as willow or birch, one diameter and a quarter in length, and one quarter less than the diameter of the shot, and covered with sheepskin with its wool outside, nailed on with copper nails.

The heads of the rammers were of hard wood, the same dimensions as the body of the sponge. They were so turned to receive a ferrule of brass to reinforce the head, which was bored 2/3 of its length to receive its staff properly fastened therein. The staffs for the ladles, sponges and rammers were each made a foot longer than the bore of the gun.

The "matches" were made of tow twisted into strands as big as a man's little finger and a little longer. They were boiled in strong lye ashes and a little saltpetre, and when dried were lashed to the end of the linstock, which was usually made of an iron rod about 2 feet long. They were lighted from a candle "lanthorn" and were applied to the priming powder on the touch-hole of the gun when firing, by the gunner or his mate in charge of the piece.

The following table of gun sizes, weights, powder charges and point-blank distance capacity has been discovered, as an interesting adjunct, showing in a rough way approximate figures that were considered as near enough for all practical purposes in the bygone days of "cast-iron" gunnery.



A SHIP'S GUN AND ITS CARRIAGE

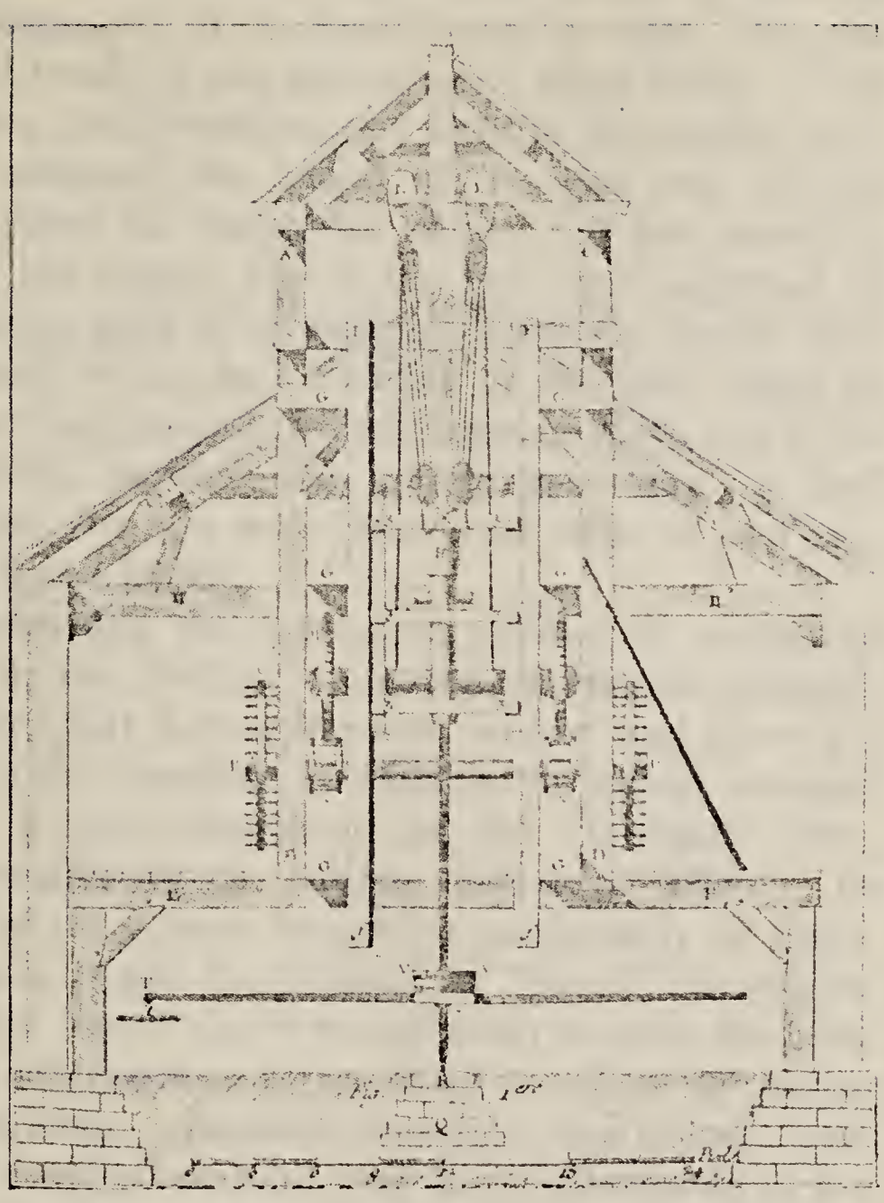
1771779

Diameter of Bore, inches	Length of Gun ft., inches	Weight of Gun pounds	Diam. of Cartridge, inches	Length of Cartridge, inches	Weight of Powder, pounds	Diameter of Shot, inches	Weight of Shot, pounds	Point Blank Distance, feet
1.2	4.6	200	1.0	4.0	0.8	1.1	0.5	180
2.2	6.0	400	2.0	7.4	1.4	2.1	1.5	270
3.0	7.0	750	3.0	8.4	2.8	2.8	3.4	360
3.6	8.0	1400	3.5	10.4	4.0	3.5	6.0	480
4.2	9.0	1900	4.1	12.0	6.4	4.0	9.0	525
5.3	11.0	4400	5.2	16.0	11.6	5.0	18.0	550

The above figures include standard full-size cast-iron ordnance from swivel guns to 18 pounders, for military or field use. Those intended for naval use would be about 2/3 the length, and in some instances where the guns were to be used in cramped deck quarters, 1/2 the length specified, with consequent lighter weight and carrying capacity, and all assuming the guns were "true-bored."

The qualifications of the 18th century gunner might have been lacking and probably were, in many respects to begin with, especially in the American sea-service and privateering; but as experience produced knowledge of his equipment and how to use it, skill was gradually acquired. The seaman gunner's knowledge naturally was more difficult to absorb than that of the land artillerist, due to unsteady conditions on ship board, and the handling of his gun in a rough sea-way. His accessory equipment consisted of practically the same kind of tools or implements as those used in shore batteries,

including rammers, sheepskin sponges, linstocks with their "matches," priming irons, quoins or wedges for use in elevating the piece, and copper ladles when required for handling loose powder charges. The ammunition consisted of solid shot, double-headed and cross-bar shot for tearing sails and rigging, canvas or paper cartridges, budge barrels for loose powder, baskets and tubs for bringing shot to the piece, and water buckets. His crew readily gained familiarity with their duties, and were usually made up of a gunner, a sponger, a loader, two "in-and-out-men" and a powder boy. Two guns were oftentimes handled by the same gun-crew. He was supposed to know the names, length, weight and "fortification" of every piece in his battery, and be able readily to tell how much powder was a sufficient charge, what shot was fit, and the limit of charge by the use of the ramforce ring on the gun, and the limit of the gun's outboard exposure by the use of the cornice ring, if his guns were so marked; also to use the utmost care in the selection of a sober, honest and reliable man for the yeoman of the powder, who was never allowed to beat in the head of his powder barrels with an iron tool, but with a wooden mallet. He was also expected to know whether his guns were true-bored or not and to proportion his charge according to the thinnest side of the metal, and accordingly take his direction or aim at the breech of the piece just over that place where, by his knowledge, he located the middle of the bore within the piece, enabling him to make a good shot with

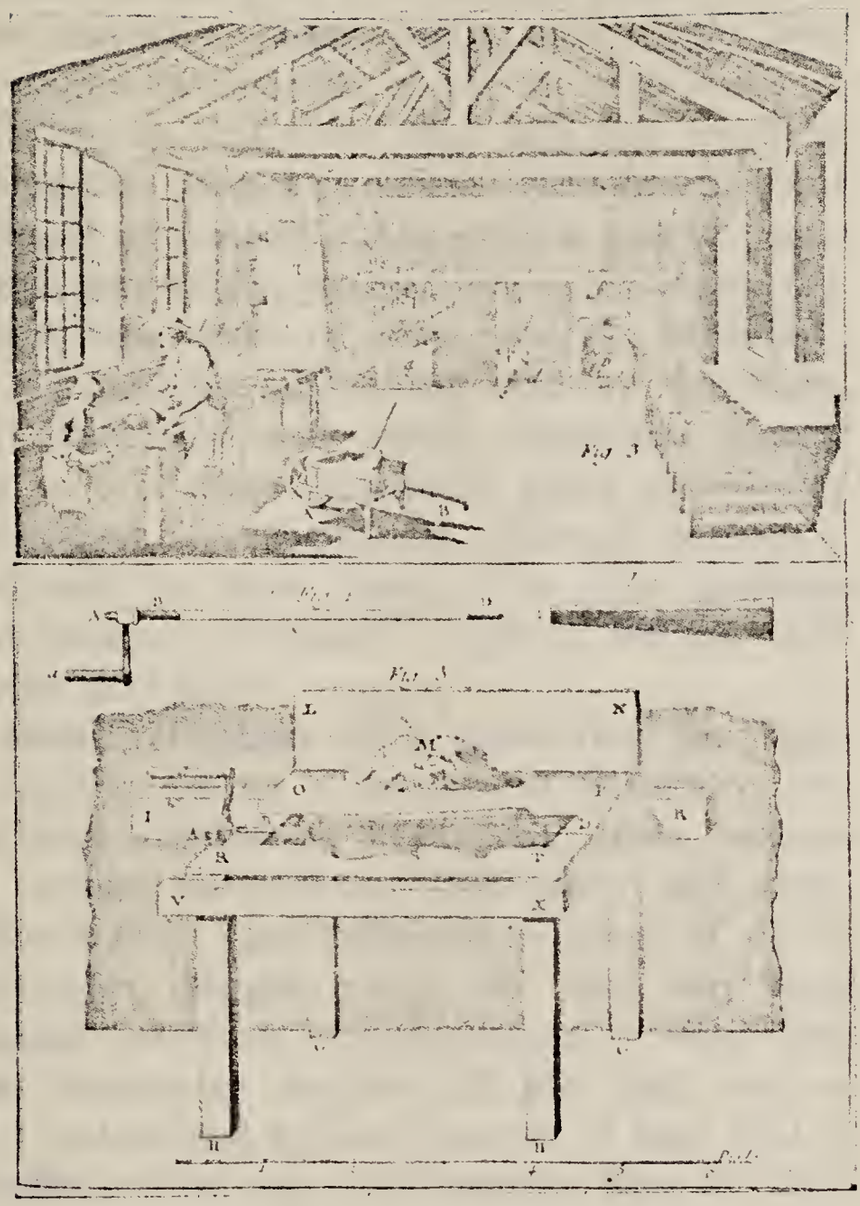


BORING MILL

a bad piece. He also knew it was important to wad his shot and to ram it home close to the powder or cartridge, for if it should not be close, the gun would break in the vacant place when firing. Concerning gun breeching and tackles, the seaman gunner measured the length of the gun and allowed four times its length for tackle, and for breeching twice the length, and if the rope was suspected of not being good or of sufficient strength, quoins were fastened to the deck forward of the fore trucks of the carriage, that they might have no play; and if the breeching, tackles and quoins gave way in foul weather, the gun was dismounted from its carriage, stowed and lashed.

Concerning the system or method of mechanics used in the drilling or boring of cannon, research develops that during the 18th century and about the time of the American Revolution the boring consisted only in the enlargement of the "founded" bore, conformable to the caliber desired to attain. In some of the cannon foundries, particularly in Pennsylvania, it was the practice to "found" the cannon over the "core" (as it was termed) or *with* the bore, which afterwards was regulated to caliber by means of the borer. In other foundries the cannon were cast "massive" or solid, and bored afterwards in the boring mill,—and from what can now be discovered, this latter method prevailed at Salisbury. By a careful review of what few references there are extant on this mechanical subject, as applying to those times, it is found that the boring mill worked vertically, the

machine being constructed according to the old and imperfect system whereby the cannon rested stationary in a vertical position, muzzle down, fastened or wedged with wooden wedges or forms, into a heavy wooden sledge-like receptacle, which moved up and down in the greased furrows or run-ways of two heavy wooden vertical side beams, which sledge, with its cannon therein, could be moved up and down by means of blocks and falls from overhead. Beneath the cannon and in the direction of its axis, was the boring spindle, arranged to turn around in a heavy wooden greased frame-work, attached to the bottom of which spindle was a heavy iron base-ring, and bolted to that were wooden cross-beams of considerable weight and length, by which means the boring spindle was turned around by a horse walking about in a large circle. The pressure required while boring was effected by the weight of the sledge and cannon, which pressure was regulated by counterbalances. But as the borer must have had some scope or "play," and was thus brought out of its exact vertical position, and as the cannon itself must not have been always fastened firmly and exactly in its perfect vertical axis, it is easy to understand why, by reason of these rather crude mechanics, the finished bore of the gun was not perfect to the axis line. By the process of gearing at the base-ring of the machine, the speed of the borer might have been increased at the end of the horse walking-beam without increasing the speed of the horse, and doubtless this was done. The lubrication of the

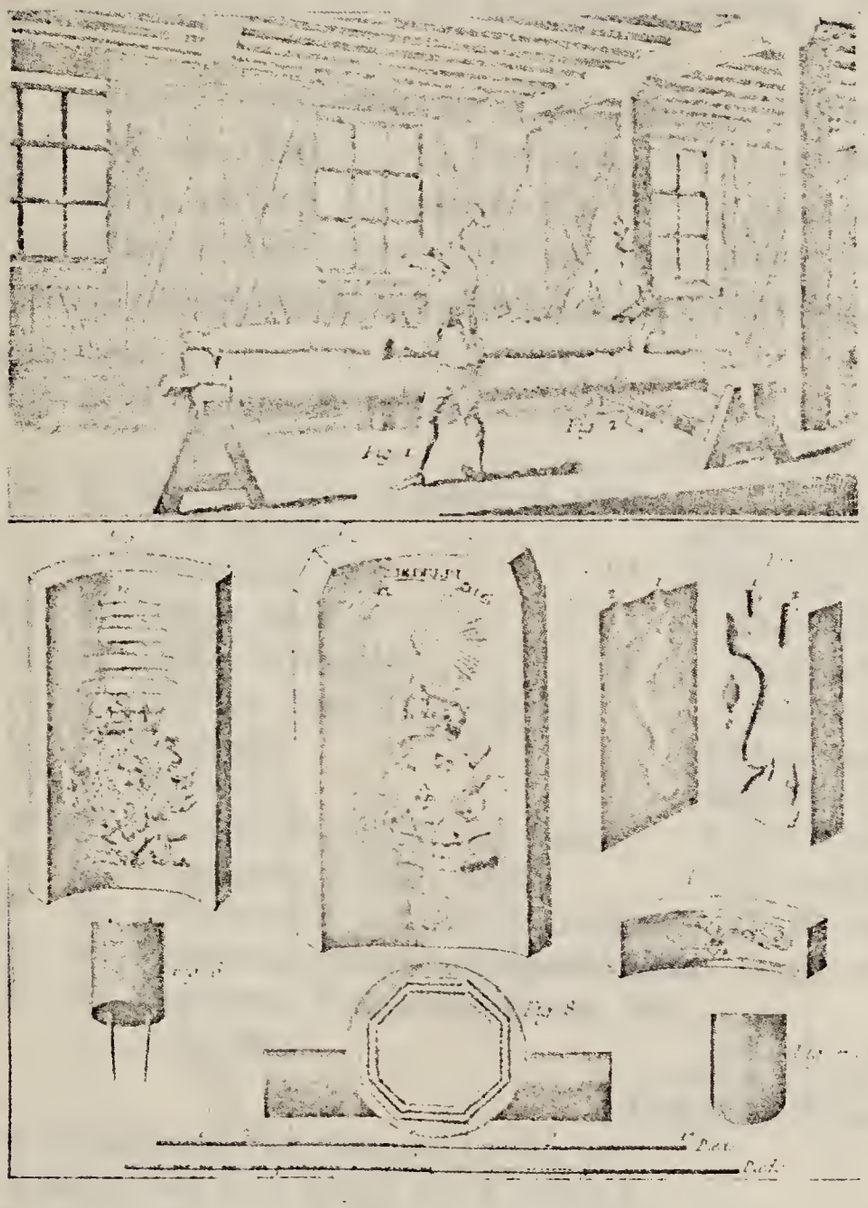


SWIVEL PATTERNING

boring tool must have been quite crudely performed, requiring the stopping of the mill at frequent intervals to "grease up," by wadding the hole or bore started in the gun, with enough grease to last until the next stop. These boring mills might have been arranged in batteries of two or more mills in one building, so that more than one gun could be undergoing this process at a time. The boring-point or tool itself at the end of the spindle was the most important part of the equipment, as it necessarily must have been made of steel properly hardened; and as the refining mill, taken over by the State, was at Colebrook, and many references appear relating to this other important plant as existing not *far* distant from Salisbury, although perhaps a day's journey in those times, it is quite probable that the necessary "temper" required for the tools came from that plant.

Occasional references exist concerning the "patterns" for the casting of cannon at Salisbury, but the patterns themselves have long since become extinct, unless the cannon that were cast from the patterns may form sufficient evidence of all of the intricacies, designs, rings, etc., that may have been made for their ornamentation. What few of them remain as trophies of the past, are so corroded and wasted by the elements of time that it is difficult now to gain any accurate idea of their original appearance. From the letters of Capt. John Deshon of Groton, found in the *Huntington Papers* relating to the casting of guns of the frigate *Con-*

federacy, it would appear that the pattern for those 12 pounders was very elaborately designed. It is quite possible that some of the guns that were cast at Salisbury for naval use, were copies of some of the guns captured from British privateers and used as patterns, barring any regal ornamentation or mottoes that many of them must have displayed in relief along their barrels and supplanting them by United States or State Arms. An 18th century naval gun, discovered stored away in the basement of the Connecticut State Armory in Hartford and portrayed herein, has the Arms of the State and its name "HANKS" appearing just forward of the touchhole. The 18th century naval guns were gradually reduced to two types,—the long (18 to 25 calibers) and short (about 15 calibers). Near the end of the century carronades began to be used, particularly for upper deck guns. They were very short and light, but fired large projectiles, with low velocity. Naval actions were usually fought at such very short ranges that a gun of this type was often exceedingly effective. The heaviest naval guns were usually about 32 pounders, which were carried by the largest ships. The gun carriages were constructed with heavy oaken sides called "brackets," joined by smaller flat timbers called "transoms," the whole supported by heavy wooden trucks or wheels six inches to a foot in diameter. The trunnions of the gun rested in trunnion sockets in the tops of the brackets. Carriages of carronades were differently constructed. They were not in evidence during the Revolution,



TRUNNIONS AND PATTERNS FOR ORNAMENTATION

not having been designed or cast until about 1779 in Scotland. There appears to be no record of them being patterned or cast at Salisbury during this period.

An account[13] rendered by Col. Joshua Porter, manager of the Salisbury Furnace, for a *seven-months blast,* ending December 31, 1776, discloses the following items, which give an interesting and fair idea of the material supplied during 1776 alone:

tons	cwt.	qrs		
116	17	0	Cannon—9 pdrs—12 pdrs—18 pdrs—	£8179–10—0
40	1	1	do—3 pdrs—4 pdrs—6 pdrs & swivels	3205—1—5
38	3	2	Shot and Ball	1527—5—4
0	15	3	Grape shot	37—6—1
0	3	2	Hand Grenades	19–10—0
0	3	2	Hollow ware (iron pots)	6–11—4
8	9	2	Castings	254—8—8
80	2	0	Pig iron	600–15—0
7	4	0	12 cannon, 6pdrs on hand	576—0—0
0	7	2	1 cannon, 6 pdr, light	30—0—0
0	17	2	1 cannon, 9 pdr, short at muzzle	52–10—0
1	10	0	3 cannon, refused, different sizes	7–10—0
4	19	1	Pig iron; Forge Hammers, etc. on hand	46–10—0
				£14,542–17–10

Sundry deductions for charges in the account against the first blast, for a Boring Mill, Cannon Patterns & Tubs to cast the Cannon in, left on hand, with an old moulding house, and sundry articles, provisions &c., supplied for the second blast, £334–19—0

[13] Papers of Malcolm D. Rudd.

Voluminous contracts, records, agreements, account books and other papers pertaining to the operation of the Salisbury Cannon Foundry are on file among the State Archives at Hartford. A review of some of these interesting documents indicates that while many consignments of cannon were "on Colony Account" and charged to the selectmen of various towns, there were also depot agents who were authorized to receive, receipt for and distribute a large number of guns that were cast for the naval and military service, as called for by the several organizations and ships that needed them throughout the State and on the seaboard. Gen. Philip Schuyler appears to have received many cannon from this foundry. New London, New Haven, Milford, Stratford, Fairfield, Norwalk, Stamford and Greenwich received these "protectors of the coast" quite abundantly. Andrew Huntington and Capt. Jabez Perkins of Norwich are frequently mentioned in the books as receiving swivels, 4 and 6 pounder guns for ships and privateers; and for the Connecticut River towns, Capt. William Tiley of Hartford was generally the one who received the many and various team deliveries of cannon and shot for the use of those privateers hailing from the River ports. Dudley Case of Simsbury and Maj. Mark Leavenworth of New Haven were the authorized appointees to receive the guns and their supplies for the army.

The force of men employed at the Salisbury Furnace during the Revolution changed as time went on, and there must have been a good many of them

first and last by a review of the papers, records and pay vouchers. The master-workman seems to have been Lemuel Bryant. The first Clerk of the Works was William Whiting, and afterwards when Benjamin Henshaw of Middletown and William Whiting were appointed to succeed Colonel Porter, who was called into the military service, we find Benjamin Prime acting as Clerk of the Works and Officer of the Guard. The Watchman was David Oldham. One of the "clay-spankers" was David Dunbar. Jonathan Washburn and Solomon Keith were rated as moulders. Others employed were Zebulon White, Ariel Crouder, John Pumpelly, Thomas Tomlinson, John Bush, Duncan Campbell, Philip Aspel, Murdock MacLean, John MacLean, Nicholas Porter, John Welsh and Zacheus Owen.

The *List of the Government Guard* during the months of May and June, 1777, was as follows:—

Benjamin Prime, Officer of the Guard.

Anable, Abraham	Landon, Asa
Bates, Martin	Mallet, John
Beebe, David, Jr.	McLean, Jacob
Beebe, William	Moore, Alexander
Berry, James	Oldham, David
Bethrong, Abraham	Owen, Aaron
Betts, John	Pierpont, Samuel
Bignall, Richard	Pinkerton, William
Bissell, Asahel	Simmons, Perez
Bissell, Joseph	Smith, Elijah
Bliss, Timothy	Strong, Simeon
Capen, Purchase	Swetland, Aaron

Chapman, Titus
Crane, Ezra
Evarts, John
Ficks, Thomas
French, Ichabod
Grinnell, Noah
Hall, Slias
Hall, William
Tousey, Matthew
Tubbs, Martin
Wheeler, Eliphalet
Whitcomb, Edward
White, Joel
Williams, Benajah
Williams, Prince

Other men are recorded as additions to the *Government Guard.* The following names appear as doing duty at various times:— John Knickerbocker, Absolom Taylor, Noah Lyman, Jared Everest, Elisha Everest, Samuel Knight, Robert Street, James Holmes, Daniel Bostwick, Abijah Washburn, George Marsh, Stephen Maples, Negro Liester, Abel Oldham, Ebenezer Merriam and James Landon, 3d.

Patrols of four men were selected or billeted as guards each night out of this company under the command of Benjamin Prime, who, in addition to his duties as Clerk, acted as Captain or *Officer of the Guard.* Many records appear showing the names and dates of these patrols, one of which is given herewith as a specimen, viz:—

Furnace Guard, Wednesday Night, June 25, 1777

William Beebe
Matthew Towsey
Martin Bates
David Beebe Jr.

ORDERS:

To patrol from Furnace Barn to Col. Porter's corner, by and in the Bridge House & to the Upper Dam. If any disorderly person or persons appear that cannot

give a good account of themselves and are unknown, they are to be kept under guard till morning.

Countersign—*"Stratford."*

Per order Benjamin Prime.

There were numerous orders issued similar to the above with different patrol assignments and different countersigns, as shown by the "returned" Orders amongst the papers of the Salisbury budget. One of them, bearing date September 1, 1777, has but two guards posted for the night, viz: Purchase Capen and Aaron Swetland, the countersign being *"Washington".*, — Endorsement on these Orders being as follows:

"Thursday night, Asahel Bissell, Noah Grinnell and Asa Landon were relieved about nine o'clock. Abraham Bethrong was hailed by the centinel but passed him and came up toward the Guard House, the centinel calling to the guard. They turned out, and one of them laid hold of Bethrong, who struck Bissell, the man who endeavored to secure him. Bethrong having a horse with him to return, which he had borrowed, and being known was dismissed to be enquired of concerning his affray tomorrow morning."

There was a general store at the Furnace, and the accounts and day-books are replete with entries of sales of every character and description, all of which shows that the Furnace was a busy locality and quite well guarded during the entire period of the War.

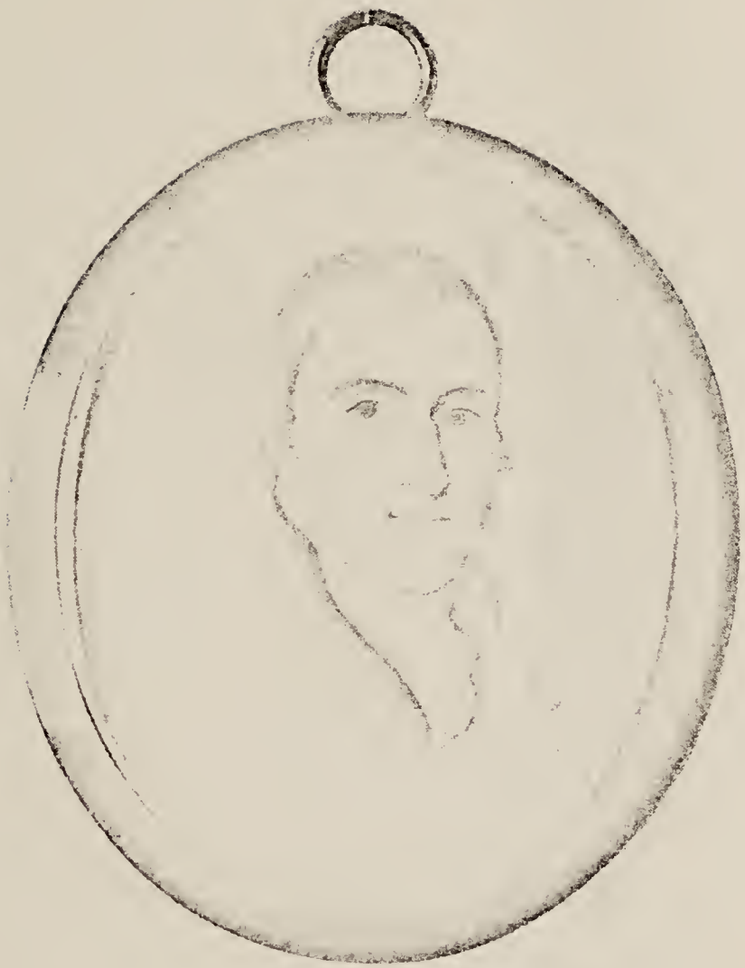
The countersigns were evidently selected with unusual care during the entire period of service when the Salisbury Furnace was in operation.

From the many orders on file a few of them are given as follows:

Colonel Warner
Salem
Thomas and Betts
Arnold
Alonso
Fairfield
Baltimore
Springfield
Seabrook
Huntington
Bellamy
Bidwell
Annapolis
Williamsburgh
Pomfret
Skenesborough
Crown Point
Congress
Anchorite
Henshaw
Norfolk
Genl. Fellows
Lee
Lainsborough
Maryland
Scrub
Washington
Stockbridge
Rockingham
Islington
Manchester
Trumbull
Woodbury
Scarborough
Fort Edward
Effingham
Columbia
America
New London
General Assembly
Milford
Furnace

COLONEL JOSHUA PORTER

Colonel Joshua Porter of Salisbury, Connecticut, whose miniature portrait is herein reproduced, was one of Connecticut's most active men during the whole period of the critical existence of the nation. He was born at Lebanon, Connecticut, June 26, 1730, educated at Yale College, being graduated in 1754; engaged for a short time afterwards in teaching school in North Carolina. He became a resident of Salisbury in 1757 and lived there for the rest of



COLONEL JOSHUA PORTER

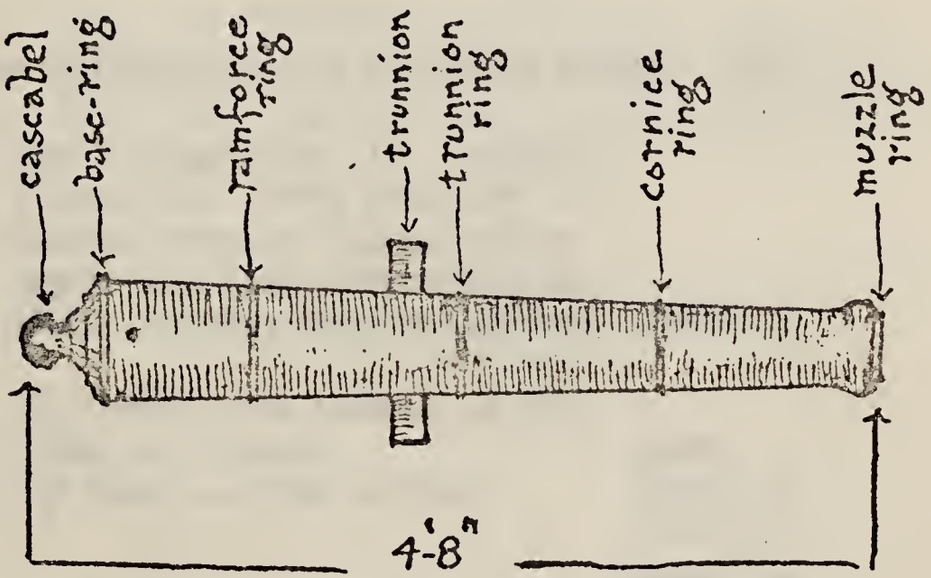
Superintendent. Salisbury Cannon Foundry during Revolutionary War

Courtesy of Peter A. Porter, Esq., Buffalo, N. Y.

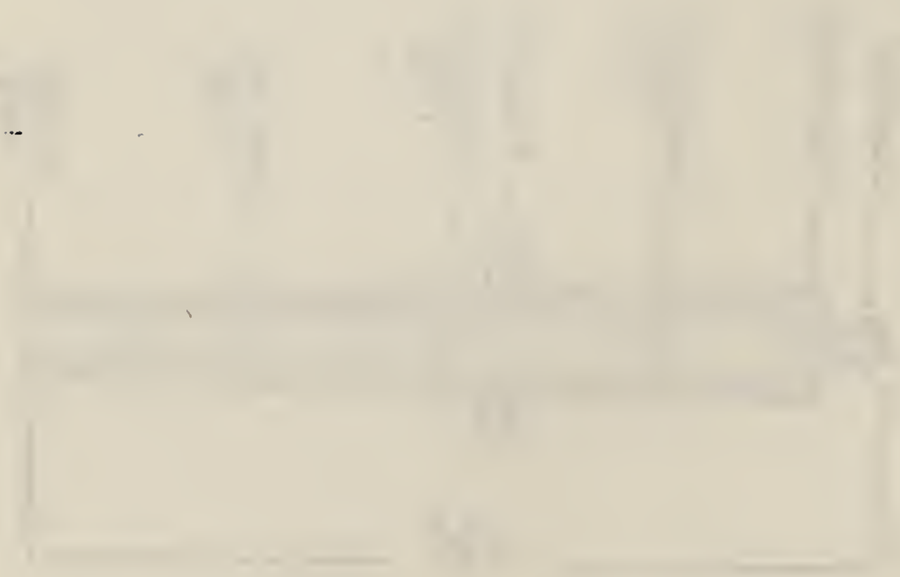
his life, and was a practicing physician there until about 1797. During the Revolutionary War he was commissioned Lieutenant Colonel of the 17th Regiment of Connecticut Militia, being in command of a regiment at Peekskill, at the burning of Danbury, and at the Battle of Saratoga; and was particularly active during the war as Superintendent of the Cannon Foundry and Furnaces at Salisbury. He was also a member of a group of patriots who advanced the prosecution of the expedition to Ticonderoga, led by his townsman, Col. Ethan Allen; and was a member of the Connecticut Council of Safety. In civil life he was Judge of Probate for the District of Sharon (which included several towns) from 1774-1812; Judge of the Litchfield County Court, 1791-1808; and a member of the Connecticut Legislature from Salisbury some forty sessions between 1765 and 1801. Colonel Porter died at Salisbury April 2, 1825.

The following sketch of a regulation six-pounder iron gun cast at Salisbury Furnaces was made from the gun itself which, until recently, was located on the stone retaining wall south of the State Armory in Hartford. While pitting and corrosion had made deep inroads on this gun, there yet remained enough of its original appearance to show the various rings around the barrel of the piece. The two rings of the most importance were the "cornice" and "ramforce" rings. The "cornice" ring, a short distance from the muzzle, was intended as an approximate limit mark for running out the gun through the

gun port on shipboard, for if for instance all of the guns of the starboard (or port) battery exceeded the limit mark when run out, there would be a pronounced "list" to the vessel on that side. The "cornice" ring, therefore, was intended to provide the gunner with knowledge for a proper curtailment for the outboard exposure of the guns. The other important ring was what was termed the "ramforce" ring which indicated the safety limit of charge for powder, wadding and shot, when measured by the sponge or rammer. But guns cast from other foundries did not always bear these markings.



6-pounder



The Connecticut ship *Defence,* commanded by Capt. Samuel Smedley, was equipped with guns of this kind as evidenced by the following papers on file in the State Library:—

Order from Gov. Trumbull

Gent:—

Please to Deliver Col° Noah Phelps or order Sixteen Six pound cannon, cast at your Furnace and belonging to this State to be by him Convey'd according to order to Boston for use of the State Ship *Defence,* lying in that Harbour.

Given under my hand at Hartford y^e^ 23 of Jan^y^ 1778.

Jon^th^ Trumbull Gov^r^

To Messrs
Henshaw & Whiting
Managers of y^e^ Furnace—Salisbury.

Dr.	State of Connecticut to Col° Noah Phelps	Cr.
1778		
March 28	To Transporting 16 Cannons 6 pounders from Salisbury to Boston for ship *Defence* belonging to this State commanded by Saml. Smedley Esq^r^ as Contract	£569:1:6
1778		
Jany 23.	By Order from Comtee of Pay Table on Treasr.	£160:
March 24.	By Ditto on ditto in full	£409:1:6
		£569:1:6

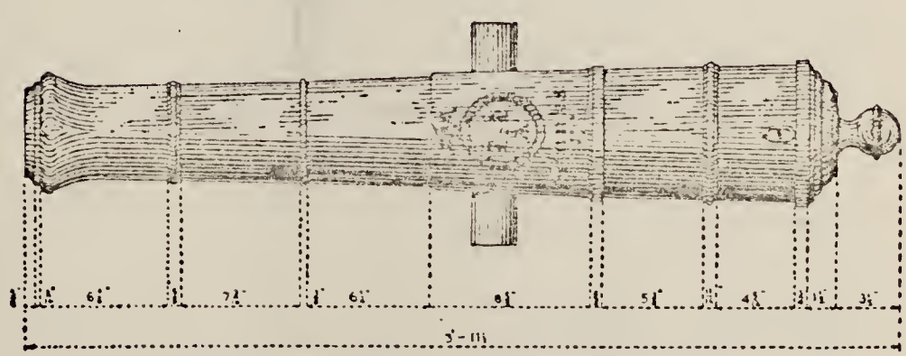
Rec^d^ March 24, 1778 an ord^r^ on Treas^r^ for £409:1:6 in full of this Ord^r^

Daniel Humphrey
Conductor of the Teams.

Received Boston February 25th 1778 of Mr. Danl Umphrey Sixteen Pieces of Six Pound Cannon Belonging to State of Connecticut one of which Being Rendered Unfit for Service by having one of the Trunnions Broke of, for ship *Defence.*

Saml Smedley.

(It took about a month to deliver these guns, probably by ox-sleds—one gun per sled.)



FROM AN 18TH CENTURY CONNECTICUT SHIP'S GUN
DISCOVERED AT HARTFORD
DIAMETER OF BORE 3⅛"

IRON SWIVEL GUN—REVOLUTIONARY WAR

Length 30″ — Bore 1¼″

THE small pieces or ordnance, or miniature cannon as herein shown, used quite extensively, especially on shipboard during the Revolutionary War, were termed *"swivel-guns,"* sometimes referred to as *"rabinets,"* and by some of the old-time mariners as *"jingals."* They were sometimes made of brass, but more generally of cast iron, and were equipped with trunnion crutches or brackets with shanks or *"stalks"* made to fit into holes that were sometimes lined with bushings. These holes were provided in the gunwales along the tops of the bulwarks at intervals, to enable the guns to be unshipped and transferred to different places. They were handy little weapons, easily carried, and were used to repel boarders, as well as in the bows of boats.

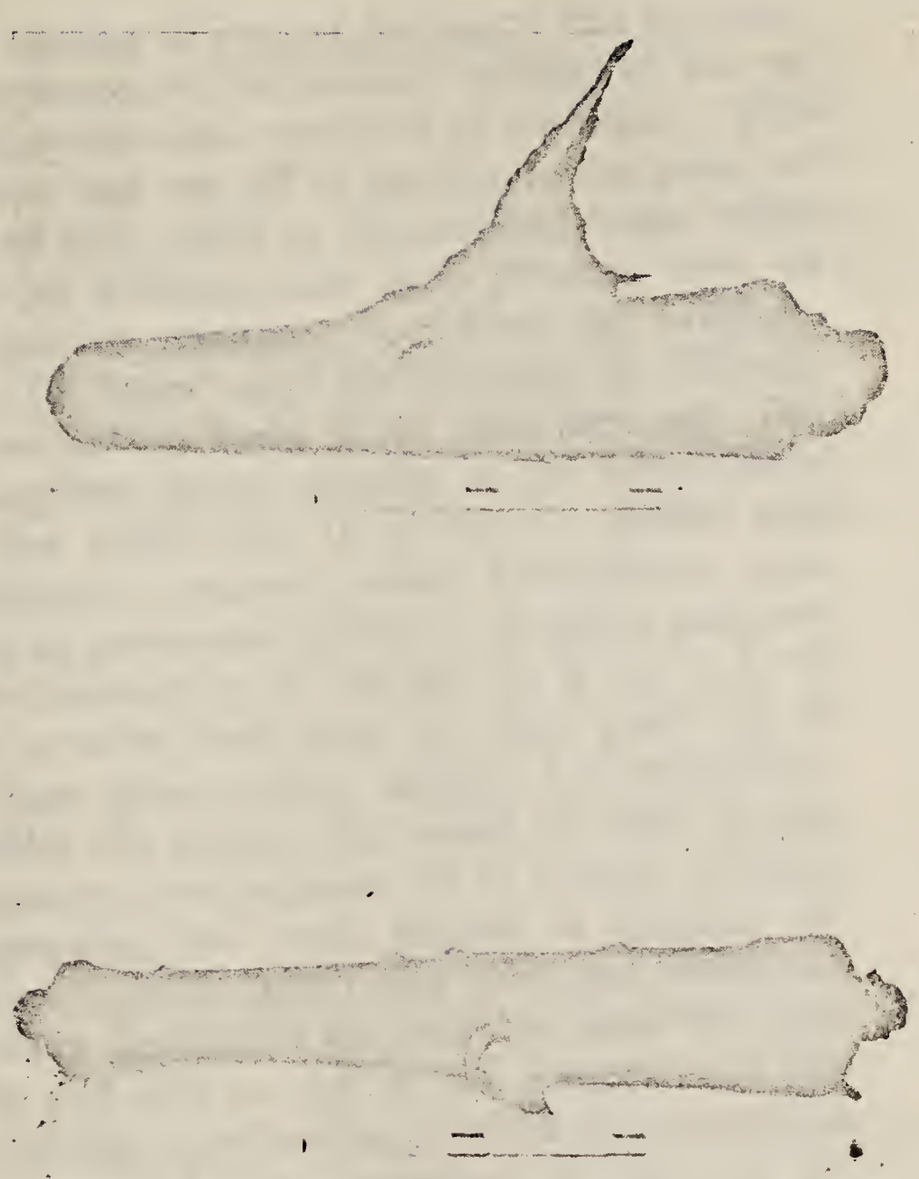
A great many swivels were patterned and cast at Salisbury for privateers especially, as shown by records, and were occasionally referred to as a part of the combat equipment of vessels along with the larger guns in battery. It has been difficult at this late day to encounter them (except quite rarely as museum pieces) as they, like many of the heavier cannon, were disposed of as junk and went the way of other cast iron, to the "melting-pot." These small guns could be "swiveled" both horizontally and vertically and were considered quite necessary and effective in close-quarter combat.

Illustrated herein are two swivels that were

raised in November, 1934, from the wreck of a British warship sunk near Yorktown, Virginia, in 1781.[14] It was necessary to photograph one of them upside down, as the shank was encumbered with a portion of the ship's bulwark. The absence of its muzzle and presence of cracks along the barrel possibly indicate the results of an overcharge the last time it was fired. The other illustration shows an almost perfect specimen with the exception of the swivel shank which was apparently corroded off. The tampion or muzzle-plug was found in its place when recovered, as shown.

Another kind of swivel used in Colonial days was the blunderbus or "murtherer" type with bell muzzle for spraying small bullets, also used for repelling boarders. These were equipped with the regulation flint-lock or "snaphance" to be used the same as a musquet, while the rabinet swivel had its own paper cartridge or capsule with wadded grape shot, and was fired from the touch-hole the same as the heavier guns. Two buckets, one containing the powder cartridges and the other the grape shot were provided by the powder boy (or monkey) wherever the gun was required, and oftentimes the gunner would supply his pockets with enough of this small ammunition and wadding for his immediate needs; his only other tools were the short wooden rod containing the sponge and rammer on each end, his "match" and lanthorn.

[14] From Mariners' Museum of The Newport News Shipbuilding & Drydock Co., by courtesy of Mr. Homer L. Ferguson, President.



SWIVEL GUNS

Raised from British Warship sunk at Yorktown, Va., 1781

Courtesy of Homer L. Ferguson, President,
Newport News Shipbuilding & Dry Dock Co.

THE casting of shot at Salisbury was generally a sequence to the cannon casting to use up what spare metal remained in the hearth. This molten iron was run off in leaders to the gangs or batteries of shot molds in the molding house where hundreds of different size shot patterns were in almost constant readiness to receive the overflow. Moldings for "pigs" were also provided by different leaders, so that no waste of the blast occurred. No record has been found relating to the construction of the shot molds, but it is fair to assume that the regulation concaved metal hemispheres were employed as permanent patterns, in gangs, properly distributed according to size for the 3, 4, 6, 9, 12 and 18 pounder guns and the shot piled up in labeled bins when cooled, waiting for requisition. The smaller (or grape) shot would be "run" in the same manner, as specimens of it clearly indicate the gang-casting and crude method of breaking off the sprues.[15] These small shot were cast somewhat smaller than the bore of the swivel to allow for easy ramming and vent as well as the roughness of the sprues, but the imperfections of solid shot accounted in many cases for the breaking of the gun by "jamming" when fired. A grape shot in the writer's possession picked up on the shore of Lake Champlain near Fort Amherst (Crown Point) could be described as merely a hunk of iron. The main body of the

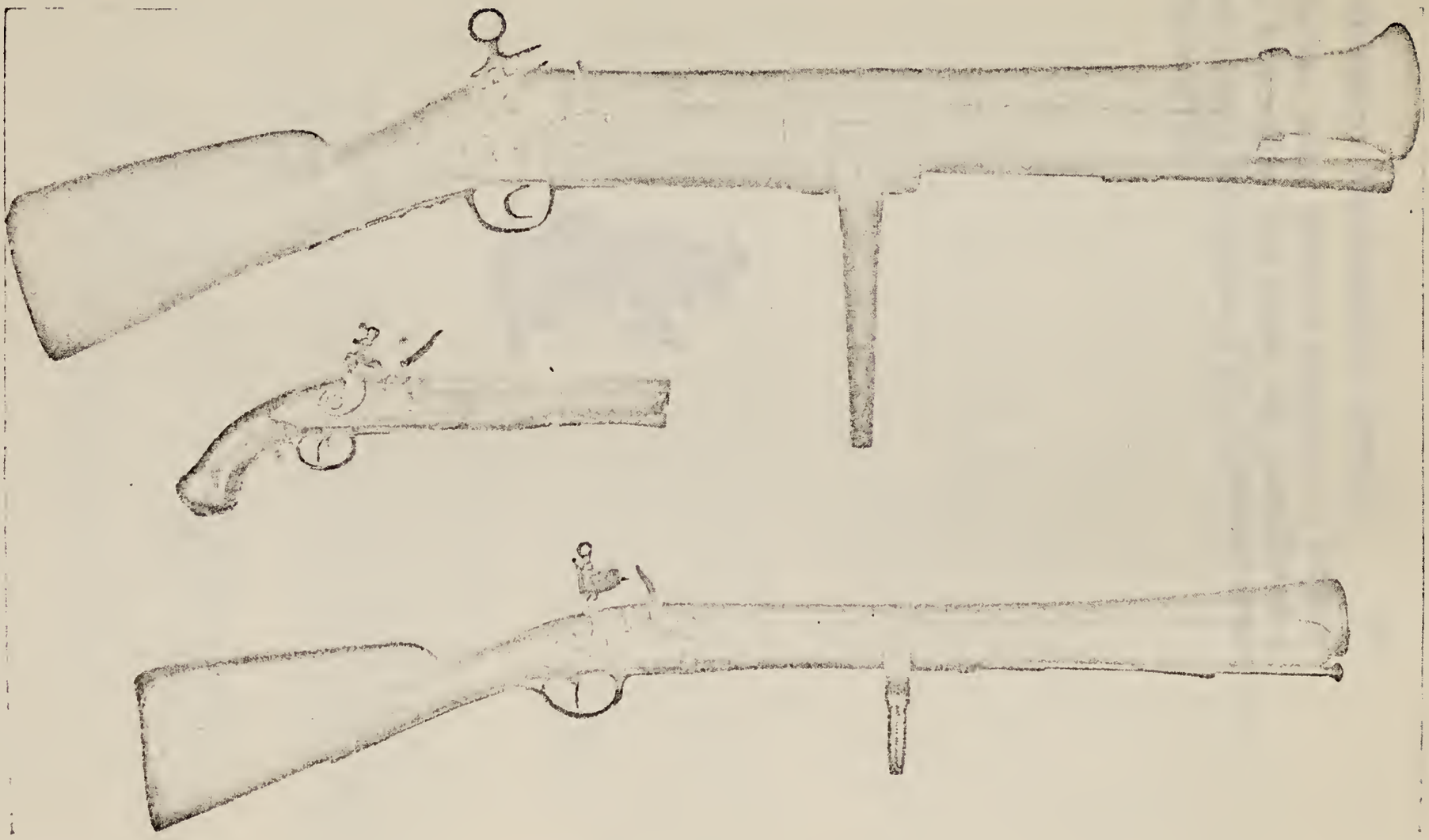
[15] Dead-heads.

shot at one time was nearly spherical, but its sprue was markedly rough at the "break-off" showing the crudeness in the method of production.

On deck, the shot or cannon balls were kept in shot-garlands, racks or troughs, usually secured to the coamings and ledges around the hatchways, or near the guns for quick service. Lead bullets for the musquets and blunderbuses were kept in "shot-boxes" located at convenient places.

The lead mine at Middletown was placed in commission early in the war. It was worked to full capacity until the supply was nearly exhausted. These Lead Works were committed to the management of Capt. Samuel Russell, and according to the geological survey of the State made by Dr. Charles U. Shepard in 1837, the mine was located directly upon the west bank of the Connecticut River. The lead here occurred in a thin seam of quartz, and had a thickness of from 10 to 20 inches, the strata dipping west between 35 and 45 degrees. The ore was associated with blende, iron pyrites, and rarely with yellow copper pyrites. The excavations that were made there during the early part of the war prove that the mine must have been worked to a very considerable extent. Twenty-six (26) bullets made a pound, and thousands of pounds were delivered from this source of supply both for the military and naval services.

The "Salisbury Furnaces," so-called, performed a very important service during the American Revolution in providing the needed cannon and ammunition



NAVAL BLUNDERBUS—SWIVELS AND PISTOL

Revolutionary War Period

From the J. B. [illegible] Collection

supply for the many different branches of defence employed both ashore and afloat, and contributed a large share toward the success of the American arms from 1775 to 1783.

The following is an extract from *Exercises of the Small Arms and Great Guns for the Seamen on Board His Majesty's Ships* (no publisher or date). The British Museum Catalog of Printed Books gives the title with the date 1765(?) and question mark as indicated. It is not in the Union Library Catalog, so the copy on file in the library of the United States Naval Academy at Annapolis is perhaps the only one in the United States. It is evidently a pamphlet printed by the British Admiralty. The pamphlet altogether has 43 pages (*Great Guns* taking 10 pages).

The extract is supplied by courtesy of Prof. Allan Westcott of the U. S. Naval Academy as characteristic of 18th century practice in naval gunnery and as utilized during the American Revolutionary War.

No record has yet been discovered relating to the number of men per gun or their nomenclature.

EXERCISE
OF THE GREAT GUNS.

The guns are to be loaded with powder and shot, the water-tubs in their places, the matches lighted, the crows, hand spikes, spunge staves, and rope spunges placed in order by the guns, and the men at their quarters.

Words of Command, and Observations.

1. Take Heed.
2. Silence.
3. Cast off the Tackles and Breechings.

4. Seize the Breechings.
5. Take out the Tampion.
6. Take off the Apron.
7. Unstop the Touch-hole.
8. Handle the Priming-wire.
9. Prick the Cartridge.
10. Handle the Powder-Horn.
11. Prime.
12. Bruise the Priming.
13. Secure the Powder-Horn.
14. Take hold the Apron.
15. Cover the Vent.
16. Handle your Crows and Hand-spikes.
17. Point the gun to the Object.
18. Lay down your Crows and Handspikes.
19. Take off the Apron.
20. Take your Match and Blow it.
21. Fire. (*You must take care that the Guns do not touch the side of the Port, when you fire.*)
22. Stop the Touch-hole.
23. Handle the Spunge-Staff.
24. Spunge the Gun. (*In spunging the gun, the Spunge is to be drawn backwards and forwards two or three times, as well as pushed home strongly, and in taking it out, turn it around two or three times in the gun. Observe to strike your Spunge well on the Muzzle of the gun, to cleanse it. If you make use of a Rope Spunge, observe to Shift Ends, and have your Rammer Head at hand.*)
25. Handle the Cartridge.
26. Put it into the Gun. (*You must put the Cartridge in as far as you can Reach with your Arm, the lower end first, and Seam of the Cartridge downward.*)
27. Wad to your Cartridge.

28. Handle the Rammer.
29. Ram home Wad and Cartridge. (*Observe to give two or three strokes to ram it well home.*)
30. Unstop the Touch-hole.
31. Handle the Priming-Wire.
32. Try if the Cartridge be home.
33. Draw the Rammer.
34. Shot the Gun.
35. Wadd.
36. Ram home Wad and Shot.
37. Draw the Rammer.
38. Stop the Touch-hole.
39. Lay on the Apron.
40. Run out the Gun.

If you exercise the Lee Guns, and it blows fresh, you must keep one Tackle hooked to the Ring-bolt on the Deck, near the Comings, and other Tackle hooked to the Ring, in the Train of the Carriage. But if you exercise the Windward Guns, keep both Tackles hooked to the Ship's side, and the Train of the Carriage.

When you exercise the Lower Deck Guns, have your Port Ropes or Port Tackle Falls clear, to let fall your Ports in case of too much Wind, and Laniards to make them fast.

Always after the Exercise is over, take care to have the Decks Clean Swabbed, that no scattered powder be left.

"An iron hand is a velvet glove."
—*Charles V.*

NOTES.—A "*crow*" was a bar of iron with a beak, crook or claw—to be used as a lever.
An "*apron*" was a leaden plate for covering the touch-hole.
A "*handspike*" was a bar, generally of wood, used as a lever
A "*tampion*" was a stopper or plug for the muzzle of the gun.

INDEX

Allen, Col. Ethan, 1, 2, 4, 11, 24.
Anable, Abraham, 43.
Ancram, N. Y., 10.
André, Major John, 2.
Aspel, Philip, 43.

Babcock, Adam, 1, 3.
Bailey, Ephraim, 17.
Banksmen, 18.
Barkhamsted, 13.
Barnet's Saw Mill, 16.
Bates, John, 14.
Bates, Martin, 43, 44.
Beebe, David, Jr., 43, 44.
Beebe, William, 43, 44.
Bellows, Samuel, 9.
Berry, James, 43.
Bethrong, Abraham, 43, 45.
Betts, John, 43.
Bignall, Richard, 43.
Bissell, Asahel, 43, 45.
Bissell, Daniel, 7, 8, 9.
Bissell, Joseph, 43.
Bishop, Samuel, 3.
Blacklead, 19.
Bliss, Timothy, 19, 20, 43.
Boring, Method of, 37, 38.
Boring tools, 38.
Boring mill, 19, 20, 21, 27, 39.
Bostwick, Daniel, 44.
Bridge House, 21, 44.
Bryant, Lemuel, 15, 43.
Bush, John, 43.

Caldwell, Charles, 12.
Caldwell, George, 12.
Calkins, Ebenezer, 18.
Calkins, Seth, 17.
Camp, Joel, 18, 19.
Campbell, Duncan, 43.
Canaan, 17.
Canaan Forges, 9.
Cannon,
  baskets, 36.
  bored, 28.
  breechings, 37.
  bridge-barrels, 36.
  carriages, 40.
  cartridges, 33.
  cracks, 30, 31.
  cross-bar shot, 36.
  double-headed shot, 36.
  drilled, 28.
  field, 30.
  flaws, 30, 31.
  grape-shot, 53.
  gunner, 36.
  honey-combs, 30, 31.
  in-and-out men, 36.
  ladles, 34.
  lengths, 30.
  linstock, 34.
  loader, 36.
  "matches," 34, 36.
  patterning, 26.
  priming-irons, 36.
  powder-boy, 36.
  quoins, 36.
  rammers, 33, 34.
  ship's, 30.
  shot, 36, 53.
  shot, size of, 33.
  six-pounder, 47, 48.
  sponger, 36.
  sponges, 33, 34.
  table of sizes, 35.
  tackles, 37.
  truly bored, 31, 32.
  tubs, 36.
  water buckets, 36.
  words of command, 56, 57, 58.

Cannon-casting:
banksmen, 24.
borers, 24.
carpenter, 24.
clay spankers, 24.
colliers, 24.
draughtsmen, 24.
dressers, 24.
fillers, 24.
firemen, 24.
founders, 24.
guttermen, 24.
mongers, 24.
ore-burners, 24.
ore-diggers, 24.
ore-pounders, 24.
ore-wheelers, 24.
patternmen, 24.
turners, 24.
Capen, Purchase, 43, 45.
Carronades, 40, 41.
Carver, David, 15.
Case, Dudley, 42.
Chapman, Titus, 44.
Charcoal contracts, 17.
Chatfield, Philip, 10.
Chipman, Thomas, 20.
Christ Church, Hartford, 13.
Church, Chief Justice Samuel, 8.
Codman, Peter, 14.
Colebrook, 12, 13, 14, 18.
Colebrook forges, 9.
Colebrook steel works, 14.
Colliers, 18.
Coleman, Chief (Indian), 14.
Confederacy, frigate, 39.
Conklin, Thomas, 18.
Connecticut Constitution, 8.
Connecticut Charter, 8.
Connecticut State Armory, gun from, 40.
Cornice ring, 30, 36, 47.
Cornwall, 17.
Cornwall forges, 9.
Countersigns, 45, 46.
Crane, Ezra, 44.
Crowder, Ariel, 43.

Day, Charles, 14.
Deane, Silas, 1, 2, 3.
Defence, ship, 49, 50.
Delaplace, Captain, 4.
Dennison, William, 13.
Depots, military, 22.
Deshon, Capt. John, 39.
Doolittle, Isaac, 7.
Dunbar, David, 43.

East Hartford powder mill, 7.
Eggleston, Benjamin, 18.
Elderkin, Col. Jedediah, 7, 15, 20, 21.
Elderkin, Bela, 15.
Evarts, John, 44.
Everest, Elisha, 44.
Everest, Jared, 44.

Farmington River, 13.
Ferguson, Homer L., 52.
Ficks, Thomas, 18, 19, 44.
Finney, Col., his regiment, 5.
Fitch, Ebenezer, 18.
Fitch, Jonathan, 18.
Forbes, Daniel, 18.
Forbes, Elisha, 10, 11.
Forbes, John, 11.
Forbes, Samuel, 9, 10, 11, 24.
Fort Amherst, Crown Point, 53.
Fox, John, 17.
French, Ichabod, 44.
Furnace barn, 21, 44.
Furnace bellows, 24.
Furnace description, 24, 25.
Furnace lot, 20.

General store, 45.

Gilbert, Nathaniel, 18.
Government Guard, 43, 44.
Great Guns, Exercises of, 55.
Grimes, Abraham, 17.
Grinnell, Noah, 44, 45.
Guard house, 21, 45.
Gun carriages, 22.
Gunner's qualification, 35.

Hall, Silas, 44.
Hall, William, 44.
Hamlin, Mrs., 15.
Hanchet, Amos, 18, 20.
Hazelton, Col. John, 11, 24.
Henshaw, Benjamin, 23, 43.
Henshaw and Whiting, 16, 19, 49.
Holmes, Capt. James, 20, 44.
Holmes, Joseph, 18.
Holloway, Ann, 10.
Holloway, George, 9.
Hopkins, Commodore, 5.
Humphrey, Daniel, 49, 50.
Huntington, Andrew, 5, 42.
Huntington, Joshua, 4, 5.
Hutchinson, Ann, 11.
Hutchinson, John, 11.

Iron master, 11.
Iron moulders, 15.

Jackson, Elias, 17.
"Jingals," 51.
Johnson, John, 14.
Jones, Ephraim, 17.

Keith, Solomon (moulder), 43.
Kent forges, 9.
Kingman, Samuel, 17.
Knickerbocker, John, 44.
Knight, Samuel, 44.
Knox, Genl. Henry, 4.

Lake Champlain, 53.
Lamb, Thomas, 9, 11.
Landon, Asa, 43, 45.
Landon, James 3d, 44.
Lax, William, 22.
Lead bullets, 54.
Lead works (Middletown), 54.
Leavenworth, Major Mark, 42.
Lebanon, 6, 13, 15, 17.
Liester, negro, 44.
Lime Rock, forge, 9.
Litchfield, 17.
Livingston, Robert, Jr., 10.
London steel, 19.
Lyles, Everett E., 9, 11.
Lyman, Noah, 44.

MacLean, John, 43.
MacLean, Murdock, 43.
Mallet, John, 43.
Maples, Stephen, 44.
Marsh, George, 19, 44.
Marshall, William, 14.
Matthewson, William, 18.
McCarly, Charles, 14.
McLean, Jacob, 43.
Mead, John, 14.
Morrison, Ebenezer, 44.
Middleborough, Mass., 15.
Middletown, 22.
Miles, John, 17.
Miles, Stephen, 17.
Miles, Stephen, Jr., 17.
Molding house, 20, 21.
Molds and models, 26, 27.
Moore, Alexander, 43.
Mumford, Thomas, 1, 3.

New boring mill, 20.
New Hartford, 13.
New Haven powder mill, 7.
Newport News Shipbuilding & Dry Dock Co., 52.
Norfolk forge, 9.

Oblong, N. Y., 14, 17.

Officer of the guard, 21.
Ogden, Jacob, 13, 14.
Oldham, Abel, 44.
Oldham, David, 15, 43.
Orders, Government Guard, 44, 45.
Ore diggers, 18.
Owen, Aaron, 17, 43.
Owen, Charles, 17.
Owen, Elijah, 11.
Owen, Eliphalet, 11.
Owen, John, 18.
Owen, Lennerd (*sic*), 11.
Owen, Zacheus, 43.

Parker, Medad, 18, 20.
Parson, Col. Samuel Holden, 1, 2, 3.
Patrols, 44.
Pattern-makers, 18, 39.
Pattern making, 39, 40.
Perkins, Capt. Jabez, 42.
Pettibone, Col. Jonathan, 28.
Phelps, Col. Noah, 49.
Pierce, Lucy, 11.
Pierpont, Samuel, 43.
Pinkerton, William, 43.
Pitkin, William, 7.
Pitkin, Governor William, 8, 12.
Porter, John, 6.
Porter, Col. Joshua, 3, 8, 15, 16, 18, 23, 28, 41, 43, 44.
Porter, Nicholas, 18, 43.
Powder mills, 7.
Prime, Benjamin, 16, 21, 43, 44, 45.
Proving of cannon, 20, 30.
Pudney, John, 18.
Pumpelly, John, 43.
Putnam, Genl. Israel, 2.

"Rabinets," 51.
Ramforce ring, 36, 47, 48.
Ranney, Stephen, 22.
Ransom, William, 14.
Reed, John, 10.
Refined iron, 12.
Rockwell, Jerusha, 13.
Rockwell, Joseph, 13.
Root, Jesse, 3.
Rowley, Timothy, 17.
Rudd, Malcolm D., 41.
Russell, Capt. Samuel, 54.

Sage, Hezekiah, 18.
Safety, Council of, 6, 13, 14, 20, 21, 22, 23.
Salisbury, Account books of, 42.
Salisbury, Furnace account, 7 months blast, 41.
Salisbury forges, 9.
Salisbury furnaces, 9, 54.
Salisbury incorporated, 7.
Salisbury, Settlement of, 7.
Salisbury town records, 9.
Sandisfield, Mass., 18.
Schuyler, Genl. Philip, 42.
Sharon, 17.
Sheldon, Ezra, 18, 20.
Sheffield, Mass., 17.
Shepard, Dr. Charles V., 54.
Ship's gun, 18th century, 50.
Shot garlands, 54.
Shot racks, 54.
Shot sprues (dead-heads), 53.
Shot troughs, 54.
Simmons, Perez, 43.
Smedley, Capt. Samuel, 49, 50.
Smith, Elijah, 43.
Smith, Richard, 7, 12, 13.
Smith, Seth, 13.
Sprues, 19, 27.
Street, Robert, 44.
Strong, Simeon, 18, 43.
Sturmy, Capt. Samuel, magazine, 31, 32.

Swetland, Aaron, 19, 43, 45.
Swivel, ammunition, 52.
Swivel, blunderbus, 52.
Swivel, guns, 51, 52.
Swivel, "murtherers," 52.
Swivel, "stalks," 51.
Swivels, from Yorktown, Va., 52.

Taylor, Absolom, 44.
Teamsters, 18.
Ticonderoga, 1, 2, 4, 5, 11.
Tiley, Capt. William, 12, 28, 42.
Tomlinson, Thomas, 43.
Tousey, Matthew, 44.
Trumbull, Gov. Jonathan, 5, 6, 14, 15, 21, 49.
Tubbs, Martin, 44.
Turner, Zebedee, 17.

U. S. Naval Academy, 56.
Upper dam, 21, 44.

Wales, Nathaniel, 7.
War Office, Lebanon, 6.
Washburn, Abijah, 44.
Washburn, Jonathan, 43.
Washington, General, 28.
Webb, Charles, 3.
Welsh, Capt. John, 18, 43.
Westcott, Prof. Allan, 56.
Wheeler, Eliphalet, 44.
Wheeler, William, express rider, 17.
Whetten, Thomas, 17.
Whitcomb, Edward, 18, 25, 44.
Whitcomb, Robert, 18, 20.
White, Benjamin, 9, 10.
White, Joel, 44.
White, Zebalon, 15, 43.
Whiting, William, 23, 43.
Whittlesey, Mrs., 15.
Williams, Benajah, 18, 19, 44.
Williams, Ellen C., 6.
Williams, Ezekiel, 3, 12.
Williams, Prince, 44.
Williams, William, 3.
Winchester, 17.
Windham, 15.
Windham powder mills, 7.
Working force, 24, 42-43, 44.
Workmen exempt, 13, 14.
Wyllys, Samuel, 1, 2, 3.

Yeoman of powder, 36.

F84669.57

6029 1